CANADA , Tariff Board
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Report by of

THE TARIFF BOARD

in Reference[s] .

Relative to the Inquiry Ordered
by the Minister of Finance
respecting

CHEMICALS

•

VOLUME 4
Part II
General Considerations

•

Reference No. 120

CANADA

Report by

THE TARIFF BOARD

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L.C. Audette, Chairman
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The Honourable Mitchell Sharp, P.C., M.P.
Minister of Finance
Ottawa

Dear Mr. Sharp:

I refer to Mr. Harris' letter of September 21, 1956 and to Mr. Fleming's letters of October 11, 1957 and December 21, 1959 in which the Tariff Board was requested to conduct an inquiry respecting chemicals.

In conformity with Section 6 of the Tariff Board Act, I have the honour to transmit Part II of Volume 4 of the Report of the Board, in English and in French. This volume contains some general considerations. Further volumes will be forwarded to you as soon as they have been completed.

A copy of the transcript of the proceedings at the public hearings accompanied the first volume of the Report.

Yours sincerely,

L. C. Audette

Chairman

A Note on the Organization of the Report - Reference 120

The first four volumes of the Report by the Tariff Board respecting Reference 120, Chemicals, relate to the reference as a whole; the eleven volumes which follow (Volumes 5 to 15, inclusive) relate to the products which were the subject of the Board's inquiry. The principal subject matter of each of the volumes is given below in terms of the headings of the Brussels Tariff Nomenclature (B.T.N.). Occasionally, chemicals of different B.T.N. headings are dealt with together, for example, chlorine (28.01) and caustic soda (28.17); the more detailed tables of contents of the individual volumes indicate where this occurs.

To the extent that particular statistical tables could be related to specific products or B.T.N. headings they are included in the statistical appendix of the volume which deals with that product or heading. Some tables, which could be related only to broader groupings of chemicals, are included in the statistical appendix to the last volume dealing with such broader groupings: inorganic chemicals in Volume 7, organic chemicals in Volume 9 and artificial resins and plastics in Volume 15.

Because of the unprecedented amplitude and complexity of Reference 120 - Chemicals, many parts of Volumes 5 to 15 were written a considerable time before the first four volumes. This gives rise, occasionally, to apparent discrepancies, attributable to the passage of time, particularly between Volume 4 and those which follow.

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PREFATORY NOTE

In the Introductory Volume to this Report the Board included certain general observations as well as its recommendations for tariff changes; Volume 2 contains a cross-classification between "Goods in Recommended Items" and "Existing Items"; Volume 3 contains a cross-classification between "Goods in Existing Items" and "Goods in Recommended Items".

In Volume 3 there also appear Corrigenda to the Recommended Schedule in Volume 1; certain of these corrigenda would change the classification of some products in Volume 2.

In Volume 4, Part I, the Board published its Summary and Conclusions on each of the Recommended Items in the Recommended Schedule.

This volume, Part II of Volume 4, contains further amplification of subjects considered in the Introduction to Volume 1 as well as other matters. In particular, it deals with the scope of the Reference, the general circumstances of the chemical and allied industries in Canada, nomenclature, the distinction between products made and not made in Canada, end-use, certain general considerations on rates and their determination and, finally, with the recommended structure of rates.

The present volume also contains, as an appendix, a set of draft rules and notes prepared by a technical committee for comment by industry; this draft is under consideration for use in the interpretation of the recommended items.

For convenience, certain changes which occurred in the interval between the commencement of hearings and the publication of this Report are treated below.

After the public hearings and after much of the Report had been written, Order-in-Council P.C. 1965-1279 was made, on 14 July, 1965, pursuant to section 17 of the Customs Tariff; it is cited as the Customs Tariff Renumbering Order 1965-1. By this Order the numbers of the existing tariff items were changed. All the transcript of evidence, all the briefs and other papers filed in the record and all the other documentation relating to the Reference are based on the former numbers of the existing tariff items. To facilitate cross-reference between the new and the former numbers of the existing tariff items the Board, in pages 22 to 25 of Volume 1 of this Report, has set out in tabular form the former numbers of the tariff items in issue on one column with the new numbers in the adjacent column; a further cross-reference exists in Volume 3, entitled, "Goods in Existing Items", where the existing items are set forth in the numerical sequence of their former numbers followed by the new number in parentheses.

Of necessity the Brussels Nomenclature is subject to amendment in order to meet new and changing conditions or to rectify texts which have given rise to difficulty. On the 1st of January, 1965, Corrigendum No. 12 to the Nomenclature itself and Corrigendum No. 18 to the Explanatory Notes came into force. The Board has sought to guide itself by the Nomenclature and by the Explanatory Notes as amended by all corrigenda up to and including these two. As a result,

there is sometimes apparent conflict between portions of the Report dealing with representations made at the hearings and the Brussels Nomenclature in the form in which the Board has used it as a guide.

In many places in the transcript of the hearings and in some of the related documents there are references to "lists"; these references occur in the form of a proposal such as that a product be included in List 2 or that a product be given List 3 treatment. They arise from the fact that the rate proposals of the Industry Committee were originally made in four "Lists". List 1 contained the general rates proposed for the Brussels headings proposed as new tariff items; List 2 contained the rates proposed, without qualification, for specified products which were different from the rates proposed in List 1; List 3 contained certain lower proposed rates for specified products of a class not made in Canada with the qualification that they would apply only for so long as the products continued to be of such a class; List 4 contained certain lower proposed rates for specified products for particular end-uses. Though the Industry Committee's proposals were first put forward in the form of these four Lists, the proposals were not intended to urge that the Board make its recommendations in this form and were subsequently replaced by the Compilation of Tariff Proposals prepared by the Industry Committee.

SCOPE OF THE REFERENCE

The tariff items referred to the Board in the Minister's letters of reference, published in Volume 1, relate generally to chemicals and plastics, a relationship made explicit in the Minister's letters. Moreover, in these letters, some items were referred to the Board only in so far as they relate to chemicals and some general exclusions were made, particularly of petroleum products, adhesives, toilet preparations, and pharmaceutical products.

In the course of organizing the public hearings, in determining the scope of the Reference for the hearings and for its recommendations, the Board frequently has had to consider the line of demarcation between chemicals, or chemical products, and other products. At the public hearings it was evident that, even among those skilled in the field, the subject was fraught with difficulty.

At many of the public hearings, there was learned and technical discussion on the distinguishing criteria. The proposed criteria for the demarcation of chemicals and other products were often different; often they were in conflict among themselves or with existing practices. Some of the proposals before the Board undoubtedly would create difficulties of administration; others appear designed to make effective certain rate proposals rather than to allow good administration; still others show the results of careful thought designed to produce a good, workable system. The Chemical Industry Committee proposed that relevant portions of the Brussels Nomenclature for the classification of goods for Customs purposes be adopted for the purpose of organizing the material for the public hearings. This proposal commended itself to the Board; indeed, in its recommendations, the Board has adopted the Nomenclature for the presentation of its recommended tariff items.

Thus, the problem of distinguishing between chemicals and other products was considered, in large measure within the classification system of the Brussels Nomenclature, having in mind particular problems arising from the different system of the Canadian Customs Tariff. The exclusion of pharmaceutical products illustrates the problem.

The term "drugs" is used in the Canadian Customs Tariff; it is clear that the meaning of the term should not be narrowed down to synonymy with the term "narcotics": substances inducing drowsiness, sleep, stupor or insensibility. The term "drugs" in the English text of tariff item 208t is rendered in the French text by "produits pharmaceutiques"; in section 2, subsection (1), paragraph (cc) of the Excise Tax Act the term "produits pharmaceutiques" is used to render the English term "pharmaceuticals". Nevertheless it is doubtful that the words drugs and pharmaceuticals are actually synonymous: the latter, as generally used, would include many things which are not drugs, although it does seem clear that all "drugs" -- as the word is used in tariff item 208t -- are pharmaceutical products.

The Board has considered that single, unmixed substances are excluded from the reference as pharmaceuticals only when put up in dosage forms or in packings of a kind used for the product when sold at retail for therapy or prophylaxis in man or animal; in the case of

preparations containing more than one substance, on the other hand, it has deemed preparation for therapeutic or prophylactic use to be sufficient to justify exclusion. Foods and beverages, of course, are not considered to be pharmaceuticals. These lines of demarcation are consistent with those of the Brussels Nomenclature.

In the letters from the Minister, as noted above, certain other tariff items are referred to the Board only in so far as they relate to chemicals; to distinguish between products which are commonly described as chemicals and those of somewhat similar composition, not commonly so described, recourse again was made to the Brussels Nomenclature and the recommended nomenclature generally is consistent with the Brussels Nomenclature. The Board has generally considered to be a chemical within the scope of the Reference separate chemically defined compounds and elements brought to a degree of purity suitable for use in a predictable chemical reaction. In this manner the inorganic chemical can usually be distinguished from the mineral product and the petrochemical from the other products of petroleum. In Appendix 2 to Volume 8, the distinction between the petrochemical and other products of petroleum is discussed at some length.

Most of the distinguishing criteria adopted are based upon degree of refinement and purity or, sometimes, as in the Brussels Nomenclature, they are based upon function or preparation for specified uses. These criteria are discussed, where necessary, in the part of the Report dealing with the specific products.

In the past, it has not been the general practice to lay down specific criteria in statutory form in Schedule "A" to the Customs Tariff; nor does the Brussels Nomenclature, in Section VI which encompasses products of the chemical and allied industries, lay down precise criteria for every product or group of products. However, the Brussels Nomenclature sets out certain heading and chapter notes and interpretative rules which are given statutory authority by the signatories to the Brussels Convention; there are also the Explanatory Notes to the Brussels Tariff Nomenclature which give guidance on proper classification.

In its Schedule of Recommended Items, the Board has not generally recommended that criteria be adopted in statutory form. It is, of course, clear that, for administration of the Tariff, there must be dividing lines. Nevertheless the Board is quite reluctant to recommend the statutory adoption of detailed criteria for this purpose. The Board, as noted below, has made a recommendation that the Governor-in-Council be empowered to prescribe rules and explanatory notes to serve as an aid in interpretation; these rules and notes would, to some extent, establish criteria binding upon those administering the Customs Tariff; beyond the scope of these rules and notes, the Department of National Revenue, Customs and Excise, would continue to make the requisite distinction between any two types of products. It appears to the Board that this kind of administration makes full use of the learning, skills and practical experience of those who will be carrying out the administration of the Tariff, and offers a degree of flexibility while preserving the overall certainty of classification which is a valuable feature of the Brussels Nomenclature.

In applying the necessary criteria, the officers of the Department will have the benefit of any rules or explanatory notes prescribed by the Governor-in-Council, of the publications relating to the Brussels Tariff Nomenclature, of their existing experience and of their knowledge of the Canadian Customs Tariff generally; they will also have available to them the several volumes of this Report.

When decisions are made by the administration it would be of great benefit to the public were such decisions made known as widely as possible. Public knowledge of administrative decisions removes many uncertainties, allows better planning, prevents disputes, improves public relations by the elimination of resentment arising from unawareness of needed information and is generally beneficial.

THE INDUSTRY

Introduction

The chemical industry -- a rapidly developing giant -- is an extremely complex conglomeration of industries that forms an important part of Canada's overall industrial development. Within the industry itself, one firm's final product is often another firm's raw material and beyond the group its production finds its way into almost every phase of the nation's business.

There is no industry in Canada which does not consume chemicals or their products in one form or another. Among the more important consumers of the products of the chemical industry are agriculture, food processing and packing, mining, construction, electrical manufacture, soap, detergent and toilet preparations, pharmaceuticals, the pulp and paper industry, the petroleum industry, the textile and clothing industry, automotive and machinery manufacture and household and personal use. The petroleum industry, for example, uses more than a hundred chemicals in the extraction of petroleum from the earth and in its refining and processing to gasoline, fuel and lubricating oils and other products. The pulp, wood and paper industries use large quantities of sulphur, caustic soda and sodium sulphate, sodium chlorate, hydrogen peroxide, aluminum sulphate and synthetic resins. The textiles industry is a large user of dyestuffs, detergents, bleaches and synthetic resins; automobiles require large quantities of plastics, paints, synthetic rubber, fuel oil additives and so on. The manufacture of a countless variety of containers for products also uses large quantities of chemicals.

In some instances, both the materials supplied by the chemical industry and those used by it are the result of painstaking research and careful development to precise standards; in contrast, at times, the materials sold or used are by-products to be disposed of in whatever manner will yield some return or will eliminate obnoxious or dangerous industrial wastes.

The history of the chemical industry in Canada goes back at least as far as the mid-seventeenth century when pine tar was produced by distillation at Baie St. Paul, Quebec, and used for the preservation of wooden boats. In 1674, Nicolas Follin produced potash from wood ashes and made soap from the oil of the porpoises and sea lions found in the waters of the St. Lawrence. While forested land was being cleared for agricultural use, potassium carbonate, in the form of pot and pearl ash, became a principal Canadian export. The first recorded production of explosives in Canada was begun in 1855 by the Canada Powder Company near Hamilton, Ontario and the first major high-explosives plant was built in 1879 at Beloeil, 20 miles east of Montreal, to serve the new asbestos and copper-mining industries of the province, together with the many construction projects of that time. The first chemical plant of significance in Canada was a two chamber sulphuric acid works built at London, Ontario, in 1867, to serve the oil refining industry in southern Ontario. Other major developments of that era were the production of caustic soda in 1890, of silicon carbide abrasives in 1891 and of calcium carbide in 1892.[1]

(1) C.J.S. Warrington and R.V.V. Nicholls, A History of Chemistry in Canada; Sir Isaac Pitman & Sons (Canada) Limited, Toronto, 1949

The requirements of Canada's mining and pulp and paper industries, together with the needs of the construction industry (including ship, rail and road building) generated large demands for chemicals; the mining and the construction industries, in particular, encouraged the manufacture of explosives. In addition, as time went on, some mining companies became significant producers of certain inorganic chemicals and of fertilizers as an off-shoot of their mining operations.

Major advances in petrochemicals, plastics, detergents, paints, varnishes and fertilizers are of fairly recent origin but are among the most spectacular in the chemical industry. The chemical complexes built around Sarnia and Montreal received considerable impetus from the Second World War and, after a period of adjustment, expanded rapidly both by increases in output of basic products and by considerable diversification of product lines. A petrochemical complex also began to be built in and around Edmonton in the early 1950's, before pipelines were laid from Alberta to Central Canada. Since then there has been considerable expansion in the chemical operations in Alberta, Ontario and Quebec and, more recently, in Saskatchewan particularly for potash fertilizers. In British Columbia, the growing needs of the pulp, paper and plywood industries stimulated the development of a rather specialized branch of the chemical industry in the coastal region; in addition, the large-scale mining industry gave rise to substantial chemical production particularly in the interior of the province. In recent years, chemical plants have also been increasing in number in the Atlantic provinces -- basic chemicals, fertilizers and paints being among the principal products. Since World War II the growing importance of synthetic detergents has contributed greatly to the soap and washing preparations industry; synthetic detergents now make up more than forty per cent of the value of production of that industry. This manufacture is almost entirely in Central Canada.

In 1949, the chemical and allied industries ranked eighth in value of factory shipments among the eleven leading Canadian manufacturing industrial groups, the position it had also occupied in 1939. In 1960, it ranked sixth and kept that position through 1965. In terms of the rates of profits before tax to sales, the chemical and allied industries ranked first in 1965 and 1966 among the principal manufacturing groups.

In consequence of the great changes through the years, the chemical industry can no longer conveniently be regarded as a single industry; it is a group of industries not all parts of which are relevant to the present study. The changes in the composition of the industry have been accompanied by changes in the classifications used for gathering and reporting statistics; as a result, data are not available on a strictly comparable basis through the years. For example, a classification in 1960 provided a grouping for the Chemical and Chemical Products Industry consisting of ten industry divisions compared with the fourteen divisions used earlier.

Neither the earlier nor the current chemical group of industries conforms exactly to the scope of Reference 120. The scope of the tariff reference is necessarily defined in terms of commodities; the industry, in terms of establishments. The data for industries include some products which do not come within the reference, such as

toilet preparations, medicinals and pharmaceuticals and, prior to 1960, vegetable oils. Again, the reference includes the principal products of many of the establishments in the group but not all of them. It includes, for example, synthetic detergents but not soap, synthetic adhesives but not natural adhesives, synthetic resins and plastics but not synthetic rubber. Establishments in the chemical industries, moreover, often produce commodities that are not chemicals; on the other hand, many of the products within the reference also are produced by establishments not classified in the chemical industries. Finally, the statistics of value of shipments, as collected and published, necessarily include double counting: the product of one firm frequently becomes the raw material of another.

One of the major omissions occurs in plastics products. Many of these products do not fall within the scope of this study and most of these are assigned to statistical groups not included here. However, one group of establishments which is omitted from the Chemical and Chemical Products group, that of Plastics Fabricators, N.E.S., undoubtedly produces a substantial volume of materials and goods that do come within the present study. Some of the firms in this group made representations before the Board. In 1963, the 299 establishments in this group had shipments valued at more than $145 million, of which perhaps forty per cent, or nearly $60 million, would be film and sheet and other basic forms, shapes and products relevant to the present reference. There are a few other exceptions, but the scope of Reference 120 covers eighty per cent of the products of the chemical industry as classified by D.B.S.

Although Reference 120 is not identical in scope with the chemical group of industries, the statistics of the group provide a useful and, indeed, necessary background for the more detailed study of the individual chemical industries and of the individual chemicals in the reference. The principal statistics of the chemical group of industries are set forth for selected years in Appendix I. Summary data are given below.

Size and Characteristics

The Chemical and Chemical Products group of industries is one of the largest industrial groups in manufacturing. In 1965 it included more than eleven hundred establishments which employed nearly sixty-six thousand persons; the selling value of its factory shipments approached $2 billion, of which about $1.6 billion are estimated to have been within the scope of Reference 120. The value added in the industry was nearly $1 billion. Imports of chemicals and allied products relevant to Reference 120 were about $520 million in 1965 and exports (including synthetic rubber) about $358 million.

While there are many small establishments in the chemical industries, the relatively few which are large account for the greater part of the total value of shipments. In 1964, the latest year for which details are available, the 81 largest establishments, each with shipments of $5 million or more, had total shipments of $1,075 million -- more than half of the total value of shipments for the chemical group as a whole. These companies also accounted for one-half of the employment in the industry.

Selected Principal Statistics for Chemicals and Allied Products, Selected Years, 1949-1965

Year	Establish-ments (No.)	Employees (No.)	Value Added by Manufacture ($ million)	Selling Value of Factory Shipments ($ million)
1949	1,037	41,328	288	587
1955	1,126	51,856	529	1,044
1961[a]	1,072	52,167	761	1,434
1964	1,140	63,844	936	1,798
1965 (prelim.)	1,102	65,544	982	1,919

(a) Data for 1961 and subsequent years are based on the revised Standard Industrial Classification, 1960, and new establishment concept, 1961

Source: Dominion Bureau of Statistics

In 1965, the chemical group contributed 5.7 per cent of the total value of shipments and was the sixth largest manufacturing industry. In value added by manufacture, in 1963 (the latest available comparison), it contributed 7 per cent of the value added in manufacturing and was the seventh largest. In terms of total employees it ranked eleventh among the industrial groups in 1965. Its employees constituted nearly 5 per cent of the total employees in all manufacturing industries. Profits before tax for the industry in 1965 were about $220 million, more than 9 per cent of the total for all manufacturing industries.

The Canadian chemical industry comprises principally four types of companies. Firstly, relatively few companies have invested large sums to produce chemicals and plastics from resources available in this country and employ a highly skilled work force. Secondly, a number of companies are concerned with chemical processing as a subsidiary function to their major activities, such as the extraction of oil from petroleum, the production of non-ferrous metals, of pulp and paper, or of such ventures as meat packing. Thirdly, there are a large number of compounders, blenders, re-processors, mixers, moulders, extruders, etc. that further process products many of which are produced by the first and second groups. These latter companies typically employ more semi-skilled and unskilled labour, and their capital investment and value-added to products is not as large as that for the first two groups of companies. Finally, there is a group of sales agents who often handle principally specialty imported products, some of which also re-package or do some compounding of the products they handle.

The linkage of products in chemical processes, differences in raw materials and in production processes, as well as differences in economies in scale of operation and in costs of transport at different stages of production help to account for the unusual variety of arrangements in the production and marketing of chemicals. Some establishments produce most of their final products by complicated

stages of upgrading raw materials. Part of the production of some establishments is shipped as basic industrial chemicals while the remainder is further upgraded into a variety of products of higher unit value, research being continually carried out on production techniques, performance and new products to improve the mix of products from the processes. On the other hand, some companies do only a minor finishing or packaging operation on a range of essentially final products.

The chemical industry possesses certain distinctive features, some of which give rise to special problems for the industry. These characteristics include the complicated relationship of chemical products and intermediates and the resulting intricate production and sales organizations, the constant flow of new products and the easy substitutability of products both from within and from outside the industry, and the relatively great emphasis on technology and research and development in both products and methods of production. The complex inter-relationship of products in the chemical industry arises from the fact that more than one product is made from the same process or raw material; often the same chemical can be produced by different processes. Frequently, two or more chemicals are necessarily produced in the same process, often in fixed proportions. Sometimes portions of various products can be withdrawn as intermediate materials from a process and sold at that stage of process. The complexity of the chemical industry is illustrated by the charts reproduced as Appendix II.

It is characteristic of the chemical industry that new products appear constantly in the market. In a country where research and development is not as extensive as in the most advanced countries and where the introduction of new processes and plants tends in some instances to lag behind that in the leading countries, this aspect of the industry poses special problems attributable to the substitution of imported products.

As a result of the two factors mentioned above, the production of chemicals tends to be very competitive internationally and, for some products, domestically as well. On the other hand, in Canada most chemicals are produced only by one or a few companies.

Because of the continuous need for expansion and because of the rapid technological developments, the chemical industry is heavily oriented to large capital investments. During the seven year period, 1960 to 1966, capital and major repair expenditures on construction and machinery amounted to more than one and a half billion dollars, exceeded in the manufacturing industries only by expenditures in the primary metals industries, in the food and beverage industries and in the paper and allied industries. In 1966, the capital and major repair investment by the chemical industry represented 9.5 per cent of the total for the manufacturing industries; it was exceeded by that of the primary metals industries (16.8 per cent) and by that of the paper and allied industries (18.8 per cent).

Capital and Repair Expenditures of Eleven Manufacturing Industries, Percentage of Total Manufacturing, 1960, 1963, 1965 and 1966

Industry	1960	1963	1965	1966[a]
		- per cent -		
Chemical & Chemical Products	9.0	8.6	10.8	9.5
Electric Products	2.8	3.1	3.0	3.7
Food & Beverages	12.0	11.3	8.9	8.1
Metal Fabricating	4.2	4.1	4.6	4.3
Paper & Allied Products	14.6	15.1	17.1	18.8
Petroleum & Coal Products	4.9	3.8	2.3	2.8
Primary Metal Industries	19.4	16.9	15.0	16.8
Printing, Publishing & Allied	2.1	2.6	1.9	1.6
Textiles	2.6	3.6	4.2	3.5
Transportation Equipment	4.9	6.2	8.6	8.0
Wood Products	4.1	4.3	4.0	3.0
Total of Above	80.6	79.6	80.4	80.1

(a) Preliminary

Source: Department of Trade & Commerce, Private and Public Investment in Canada

Capital and repair expenditures for the Industrial Chemicals group ($1,055 million) comprised about 62 per cent of the total for the chemicals group as a whole for the years 1960 to 1966; these were followed by the Other Chemicals group ($187 million), then by Plastics and Resins ($137 million). The first two groups include most of the primary organic and inorganic chemicals as well as prepared explosives.

Regionally, capital and repair expenditure follows closely the existing order of production of chemicals. For the five year period, 1962-66, $678 million (53 per cent of the chemical total) was invested in Ontario and $273 million (21 per cent) in Quebec. British Columbia received $89 million (about 7 per cent); the three Prairie Provinces, about $180 million (about 14 per cent) and the Atlantic Provinces $63 million (about 5 per cent). The shares of the Atlantic Provinces and of the Prairie Provinces reflect relatively large capital outlays in 1965 and 1966.

Undoubtedly reflecting in part the large capital requirements and the heavy reliance on research and technological advance, many of the largest companies in the chemical industry in Canada are either subsidiaries of foreign companies or otherwise affiliated with them. While foreign ownership accounts for 60 per cent of the Canadian manufacturing industries as a whole, it represents 75 per cent in the chemical industry and companies with foreign affiliations appear to account for at least the same proportion of production.

In summary, the chemical group is relatively capital extensive; while it employed less than five per cent of the total employees in manufacturing its capital and repair expenditure on construction and machinery was 9.5 per cent of the corresponding expenditures by all

manufacturing industries in 1966, slightly higher than it had been over the period 1945 to 1959. Partly as a result of its intensive use of fixed capital, the chemical group ranks high among the manufacturing groups in value added per employee. In 1963, for the chemical group as a whole the value added per employee was $14,000 compared with less than $9,000 for all manufacturing.

Growth of the Industry

With vast natural resources and ample supply of such basic raw materials as salt, sulphur, coal, coal-tar, crude petroleum and natural gas, the chemical industry in Canada has a sound base on which to develop and flourish.

The chemical industry has grown very rapidly in recent decades, following some necessary readjustment after its extraordinarily rapid development during World War II. This growth, both absolutely and with respect to manufacturing as a whole, can be seen in the increases in the value of shipments, the volume of production, the amount of capital investment and in employment.

In current dollars, the value of shipments of chemical and chemical products industries increased almost four-fold from 1949 to 1965, from a little over half a billion dollars to nearly $2 billion, a compound rate of growth of 7.7 per cent per year compared with 6.4 per cent for manufacturing as a whole. The only two principal manufacturing groups having a higher annual rate of growth over the sixteen years were the electrical products industry and the transportation equipment industry.

Value of Shipments and Rates of Growth for Eleven Leading Manufacturing Industries and for Total Manufacturing, 1949-1965

Industrial Group	Value of Shipments 1949 (Millions of Dollars)	Value of Shipments 1965 (Millions of Dollars)	Compound rate of Increase per annum (1949-1965) %
Chemical & Chemical Products	587	1,922	7.7
Electrical Products	486	1,877	8.8
Food & Beverages	2,883	6,455	5.2
Metal Fabricating	867	2,346	6.4
Paper & Allied Industries	1,093	2,858	6.2
Petroleum & Coal Products	534	1,445	6.4
Primary Metal	1,419	2,823	4.4
Printing, Publishing & Allied Industries	378	1,006	6.3
Textiles	637	1,275	4.4
Transportation Equipment	1,063	3,954	8.6
Wood Products	840	1,487	3.6
All Manufacturing	12,480	33,619	6.4

Source: 1949 - D.B.S., General Review of the Manufacturing Industries of Canada, 1954; Cat. No. 31-201
1965 - D.B.S., Inventories, Shipments and Orders in Manufacturing Industries; Cat. No. 31-001

In terms of physical volume, the chemical group has shown a rate of growth from 1949 to 1965 more rapid than total industrial production or the manufacturing industries as a whole. The index of the physical volume of production for chemical and allied products increased by about 245 per cent from 1949 to 1965, compared with an increase of 155 per cent for total industrial production and 130 per cent for total manufacturing. The increase in the volume of production of the chemical group was matched or exceeded by only one principal manufacturing industry, products of petroleum and coal, which increased by about 246 per cent.

Indices of Industrial Production and
Selected Manufacturing Industries, Selected Years

Industrial Group	1955	1959	1963	1965
		(1949 = 100)		
Chemical Products	175.3	228.7	282.5	344.7
Electrical Apparatus and Supplies	174.9	190.6	254.9	319.2
Food and Beverages	125.7	152.3	172.2	193.1
Iron and Steel Products[(a)]	130.7	155.9	191.0	239.1
Paper Products	127.2	143.4	170.1	198.3
Petroleum and Coal Products	190.3	251.9	318.0	345.9
Printing, Publishing and Allied Industries	142.3	169.6	195.2	223.3
Textiles	120.0	137.0	186.0	220.6
Transportation Equipment	147.7	135.7	190.2	250.0
Wood Products	139.5	143.4	167.3	181.7
All Manufacturing	138.3	159.0	193.9	230.1
Industrial Production	145.5	176.5	215.3	254.9

(a) Includes Primary Metal Products

Source: D.B.S., Annual Supplement to the Monthly Index of Industrial Production, Cat. No. 61-005

The chemical industry's growth is also depicted by the steadily growing amount of capital outlays on construction and machinery. The planned capital investment by the industry in 1967 of more than $350 million represents a six-fold increase from the $59 million spent in 1949. In 1967, of all the capital expenditures planned by Canadian manufacturing industries, the chemical industry's share amounted to 10 per cent, compared with 6.7 per cent of the expenditures incurred in 1949.

During the eighteen-year period from 1949 to 1966, total capital outlays by the chemical industry were more than $3 billion, representing nine per cent of similar expenditures by all manufacturing industries. Of eleven leading manufacturing industrial groups, the chemical industry's capital investment during the eighteen-year period was exceeded by only three: Paper and Allied Industries ($5.3 billion, 15.8 per cent of the total manufacturing), Primary Metals ($5.2 billion, 15.5 per cent of the total) and the Food and Beverage Industries ($3.5 billion, 10.4 per cent of the total).

Capital and Repair Expenditures,
Chemical Industry and Total Manufacturing,
Selected Years

Year	Chemical & Chemical Products Industries	Total Manufacturing Industries	Per Cent of Total by Chemical Industry
	- millions of dollars -		%
1949	59.0	874.6	6.7
1952	172.1	1,431.3	12.0
1956	183.0	1,971.6	9.3
1959	136.1	1,806.3	7.5
1963	184.5	2,157.5	8.6
1965	358.0	3,313.9	10.8
1966(a)	362.7	3,831.0	9.5
1967(b)	352.7	3,533.5	10.0

(a) Preliminary
(b) Intentions

Source: Department of Trade and Commerce, Private & Public Investment in Canada

The index of employment in the chemical products industry also increased more than the corresponding index for total manufacturing during the sixteen-year period, 1949 to 1965. The increase for chemical products was over 47 per cent compared with 28 per cent for all manufacturing and 38 per cent for the broader industrial composite. In the leading manufacturing groups listed in the table below, the increase in employment in chemical products was exceeded only by that for the Electrical Apparatus and Supplies industry.

Employment Indices for Leading
Manufacturing Industries, Selected Years

Industrial Group	1955	1959	1963	1965
		(1949 = 100)		
Chemical Products	122.2	129.4	135.4	147.5
Electrical Apparatus and Supplies	137.4	135.8	154.7	173.2
Food and Beverages	106.9	114.6	116.7	122.7
Iron and Steel Products(a)	102.9	109.7	114.4	133.1
Paper Products	118.2	123.2	127.4	138.1
Petroleum and Coal Products	125.6	138.5	139.9	140.3
Printing, Publishing and Allied Industries	118.8	121.3	126.2	131.3
Textiles	85.4	78.8	85.1	92.8
Transportation Equipment	131.2	112.3	115.5	138.3
Wood Products	107.3	103.5	110.9	119.9
All Manufacturing	109.8	111.1	116.4	128.3(b)
Industrial Composite	112.9	119.7	124.6	138.1(b)

(a) Includes Primary Metal Products
(b) Preliminary

Source: Canadian Statistical Review and D.B.S. Cat. Nos. 72-201 and 72-002

As noted above, Reference 120 is not identical in scope with the chemical group as used in the statistical comparisons. The Board's reference study excludes, for example, medicinal and pharmaceutical preparations, soap and toilet preparations. It includes, in particular, certain important fabricated products of the plastics industry which are not in the general statistics of this section of the report. While there is no practical way of making appropriate adjustments for the excluded plastics products, the industries in the chemical group that are not part of the reference can be excluded to arrive at data for the remaining industries which more nearly conform with the scope of the reference.

This diminished, more relevant group provides some four-fifths of the value added by the whole chemicals group and some five-sixths of the value of factory shipments. In 1965, this more relevant group included 876 establishments; total employment was 50,215 persons, 3.6 per cent of the total employment in manufacturing; factory shipments were valued at $1,590 million, 4.7 per cent of the total value of factory shipments in manufacturing; and value added by manufacturing was $759.4 million, 6.0 per cent of the total value added by manufacturing industries; value added per employee was $15,123, slightly higher than the corresponding figure for the chemical group as a whole and much larger than that for all manufacturing.

Geographic Distribution

Although some chemical establishments are situated in each of the principal geographic regions of Canada, the industry is heavily concentrated in Ontario and Quebec. In 1964, about 80 per cent of the number of establishments, 89 per cent of the employment and 88 per cent of the value of factory shipments and of value added were in these two central provinces; most of the remainder was divided almost equally between the Prairie region and British Columbia. The location of the chemical industry in Canada is influenced by the usual factors of: availability of raw materials, abundant supply of electric power, industrial and population concentrations, transportation facilities, the availability of services and supplies and proximity to the market.

Industrial chemicals, having low unit prices and being relatively expensive to transport, often are produced close to the sources of their raw materials or their markets. A number of Canada's largest chemical plants are located near resource processing industries such as the smelting and refining of metals, the manufacture of pulp and paper, or the sources of salt and petroleum.

Despite the fact that the chemical industry in Canada witnessed a substantial increase during the past few years, in absolute terms as well as relative to other manufacturing industries in Canada, its growth, as the following table illustrates, has been the lowest among OECD countries in a recent period. During the six-year period, 1958 to 1964, the increase in the production of the Canadian chemical industry was 40 per cent, as against an increase of 143 per cent for Japan, 126 per cent for Italy, 108 per cent for Switzerland, 60 per cent for the U.S.A. and 55 per cent for the U.K. It might be noted that between 1958 and 1964 there were a number of years (1958 to 1961) when production in the chemical industry in Canada was not advancing as rapidly as in the immediately preceding or following years. The

slower rate of increase in the chemical industry in Canada than in other OECD countries contrasts to the situation for the manufacturing industries as a whole. For all manufacturing industries, from 1960 to 1964, the increase in Canada was 26 per cent, about the same as that for the OECD countries as a whole. The rate in Canada exceeded that in the U.S.A. (22 per cent) and Britain (13 per cent) but was in turn exceeded by that in some of the other countries particularly, for example, by the exceptionally high rates of Japan (69 per cent) and Spain (66 per cent).

Production Indices for the Chemical Industry

Countries	1959	1960	1961	1962	1963	1964
			(1958 = 100)			
Canada	105	111	112	118	126	140
Austria	112	134	144	150	160	176
Belgium	120	135	141	159	176	190
Denmark	..	..	100	112	118	132
France	109	126	136	149	162	177
Germany	114	131	140	155	171	193
Ireland	115	127	..	155	164	174
Italy	121	144	167	191	207	226
Japan	111	134	152	176	206	243
Netherlands[a]	115	126	134	154	165	198
Norway	111	109	123	132	138	153
Spain	108	118	138	161	199	235
Switzerland[b]	119	144	153	165	184	208
United Kingdom	111	124	125	131	141	155
United States[c]	110	117	123	136	149	160

(a) Includes synthetic fibres
(b) Export index
(c) 1957-59 = 100

Source: The Chemical Industry 1964-65, OECD, Paris

The Canadian chemical industry also produces a much smaller range of products than the larger producing countries. In the organic field, for example, Canada was reported to produce two hundred to three hundred organic chemicals compared with about seven thousand in the United States and five to six thousand in Britain.[1]

Size of Plant

It was repeatedly stated in the course of the public hearings that the Canadian chemical industry suffers from the smaller size of its plants and lacks the economies of scale and of specialization of production runs enjoyed elsewhere. As one spokesman noted:

(1) Transcript, Vol. 35, p. 5168, 5178

> "The Royal Commission on Canada's Economic Prospects found that the average Canadian plastics plant is 40 per cent as large as the United States plastics plant, and the average Canadian chemical plant is 30 per cent as large as the United States average."(1)

The Royal Commission also noted that not all chemical plants are relatively small.

> "Nitrogenous fertilizer materials, synthetic rubber, acetylene derivatives and rayon intermediates are being exported in large volumes from Canadian plants which are every bit as large and as efficient to operate as those in the United States. Approximately one-fifth of the Nation's total output of chemicals is produced in these plants and sold abroad."(2)

At another place the same report stated:

> "In the fertilizers field, the average Canadian plant is the larger of the two. Also Canada's only synthetic rubber plant at Sarnia is bigger (or at least more fully integrated) than the average U.S. factory manufacturing this product. This is consistent with the strong competitive position of Canadian producers in the world's fertilizer and synthetic rubber markets. The typical plant making such basic chemicals as acids, alkalies and salts is similar in both countries."(3)

The significance of size of plant with respect to economies of scale, efficiency and competitive ability is difficult to assess. Economies of production include many factors besides size of plant, such as the range of products produced, utilization of capacity, management efficiency, labour and capital cost, the processes of production used, availability of raw materials and power, transportation costs and a host of other factors. In this connection, it was noted at the public hearing that:

> "Within the limited Canadian market, the economies of very long runs and large plant capacities are frequently not practical. To counteract this disadvantage calls for the highest level of efficiency, the containment of pressures which increase costs, and restraint in the manufacture of unnecessary product varieties."(4)

Because of great distances, a policy of decentralization of plants to be near to centres of consumption is followed for some products and this policy naturally tends to result in relatively smaller plants. For many specialty products smaller plants may be more suitable and economical; for an integrated chemical complex larger plants will benefit from the greater volume if there are no offsetting diseconomies. However, optimum utilization of installed capacity plays an important part in the economies of production and

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(1) Transcript, Vol. 169, p. 27879-80
(2) John Davis, The Canadian Chemical Industry, Royal Commission on Canada's Economic Prospects, 1957, p. 4
(3) Same, p. 111
(4) Transcript, Vol. 170, p. 27990

failure to approach optimum utilization can be particularly serious in large plants. In this regard it is worth noting that economies of scale in producing some products are effectively lost by the presence of two, three or more producers each supplying part of domestic requirements, none of which has a significant export market. In some of these instances producers may be taking advantage of economies of scale abroad by importing an intermediate product and carrying out only finishing operations. At times, other factors such as favourable location may permit producers to remain competitive even though foregoing economies of scale; at times, they may be content with a lower rate of return on that product, or group of products, in order to establish a position in the market or to integrate more fully their process of production, use of materials or product lines. At times, however, it is the rates of duty that permit companies to produce and market the product domestically even at higher costs of production.

The competitive position of the chemical industry in Canada is noted in subsequent volumes of this report where individual products are discussed. In general, the absence of any unusually large increase in the import balance, the continued high rate of capital investment, the growth in production, the wage and salary rates and the gross profits of the industry would seem to suggest that the industry is more than holding its own competitively even though it does not carry out as much basic product research as is done in some other countries. While the industry has increased significantly its range of products for the domestic market, there is not much evidence of a significant increase in the range of products going abroad. Exports of the industry tend to remain concentrated in a few basic lines many of which receive some advantage from a favourable raw material position in Canada. Exports, as noted below, tended to increase in 1965 and 1966 at about the same rate as imports. From 1957 to 1966, however, the absolute increase in imports has been somewhat greater than that for exports and the trade imbalance has grown but not by a substantial amount, having regard to the growth in the Canadian market for products, such as organic dyestuffs, traditionally imported and for the remarkable pace of new product development in the chemical industry throughout the world over the decade. The chemical industry itself is a large user of imported chemicals. The growth in the industry, therefore, has depended, for the most part, upon maintaining its position as a supplier of the increasing domestic market for a range of established products, with diversification into newer products as the domestic market became large enough to warrant their production. The growth in output in some of the resins and plastics, such as polyethylene and polyvinyl chloride, has been outstanding.

External Trade

The growing production and consumption of chemicals in Canada in recent years has been accompanied by a substantial increase in external trade. Imports supplied about 24 per cent of the apparent market of about $2.2 billion in 1965, compared with about 21 per cent of the market in 1957; exports took about 18 per cent of Canadian shipments in 1965, compared with less than 17 per cent in 1957.

Statistical difficulties exist in making comparisons of imports and exports similar to those noted previously for the more general industry data. The following data, therefore, are only

illustrative of the situation related, as nearly as possible, to the products encompassed by the Board's recommendations on Reference 120. Some products are included which might generally be excluded from a study of the chemical industry and some are excluded that might more generally be included. For example, such products as crude sulphur, salt, phosphate rock, potash, diatomaceous earths, primary tankage, mercury and certain radio-active materials are included and even several million dollars of imports of machinery for the manufacture of fertilizers are included because these imports are within the scope of the enquiry. Even though synthetic rubber is not part of this study, the very substantial exports of synthetic rubber are included because of the coverage of the relevant statistical class. On the other hand, the imports and exports of certain plastics products, of soap, toilet preparations and pharmaceutical preparations are excluded even though they often are regarded as closely allied to the output of the chemical industry.

Data additional to that given below are contained in Appendix I of this volume. A tabulation of imports for the year 1964, arranged by main groups of chemicals, form the Appendix to Volume One. External trade data on commodities are presented in subsequent volumes of the report where the individual commodities and groups of commodities are being considered.

Imports of chemicals and other products relevant to Reference 120 are estimated to have been $550 million in 1966; exports (including synthetic rubber), $405 million, leaving an import balance of $145 million. Both imports and exports have been increasing rapidly, as the following table illustrates.

Imports and Exports,
1957, 1964-1966

Year	Imports	Exports	Import Balance	Per Cent Increase from Previous Year	
				Imports	Exports
	- million dollars -			%	%
1957	322	200	122	..	..
1964	451	323	128	10.0	18.3
1965	520	358	162	15.1	10.8
1966	550	405	145	5.8	13.3

Source: Based on D.B.S., Trade of Canada

While the imbalance in trade is discussed in more detail in the relevant product reports, the major imbalances are indicated in the chemical groupings listed below.

Imports and Exports of Chemicals by Major Groups, Reference 120 Basis, 1966

Chemical Group	Imports	Exports(a)	Net Balance
	(thousands of dollars)		
Salt and sulphur	6,278	37,178	+30,900
Inorganic chemicals	66,433	52,692	-13,741
Organic chemicals	125,765	60,742	-65,023
Fertilizers & fert. materials	35,486	139,560	+104,074
Dyestuffs, pigments & paints	53,373	3,170	-50,203
Surfactants & detergents	10,310	687	-9,623
Explosives & photo-chemicals	8,380	(b)	-8,380
Pesticides, etc.	17,908	1,248	-16,660
Plastics materials & shapes(c)	159,581	90,378	-69,203
Misc. products(d)	66,280	19,595	-46,685
Total	549,794	405,250	-144,544

(a) Excludes re-exports
(b) Exports not available separately
(c) Excludes certain plastics products; exports include synthetic rubber
(d) Includes, among others, industrial chemical specialties, automotive chemicals and mineral oil additives; imports include $12 million of fertilizer machinery and parts

Source: Based on D.B.S., Trade of Canada

From the above table it is apparent that, in terms of these groupings, there is a large import balance in organic chemicals, dyestuffs, pigments and paints, synthetic resins and plastics, including film, sheet and other basic shapes, and in the miscellaneous group of chemical compounds. It is in fertilizers and fertilizer materials, salt and sulphur that Canada shows an export balance. It might also be noted that there are large exports in some of the other categories; moreover, Canada is a net exporter, on a substantial scale, of some other products closely associated with the chemical industry, in particular synthetic rubber and some mineral products.

Canada's external trade in chemicals is predominantly with the United States of America and Britain. During the seven years, 1960-66, more than 80 per cent of imports, on average, were from the U.S.A. and nearly 8 per cent were from Britain. For exports other countries assume far more significance than for imports; on the average during that seven year period, 45 per cent of exports were to the U.S.A. and 15 per cent to Britain.

Canada's Imports and Exports of Chemicals and Allied Products, Selected Years, 1957-1966

(A) Imports

Year	From All Countries $ million	From the United Kingdom $ million	%	From the United States $ million	%
1957	327.6	23.6	7.1	282.2	86.2
1961	404.2	29.6	7.3	337.1	83.4
1964	451.4	32.3	7.7	375.4	83.2
1965	519.6	34.4	6.6	430.3	82.8
1966	549.8	32.3	5.9	452.3	82.3

(B) Exports

Year	To All Countries	To the United Kingdom		To the United States	
1957	200.2	31.5	15.7	82.2	40.9
1961	249.8	36.6	14.8	106.5	40.7
1964	322.7	48.6	12.2	142.3	52.8
1965	357.5	45.0	9.7	187.6	60.7
1966	405.3	43.5	10.7	229.1	56.5

Source: D.B.S., Trade of Canada

Prices and Price Trends

The details of prices and price movements of individual chemical products and groups of products are discussed in the product reports; some highlights of the over-all price pattern are mentioned in this section.

The prices of the products of the Canadian chemical industry, in overall terms, have recorded a more moderate increase during the past few decades than have the prices of most other manufactured products. The wholesale price index of chemical products increased by 100 per cent between the 1935-39 base period and 1965, compared with an increase of 150 per cent in the general wholesale price index. The increases in the prices of other selected industrial products during this period were: 234 per cent for wood products; 165 per cent for iron products; 147 per cent for textile products; 118 per cent for non-ferrous metal products; and 92 per cent for non-metallic minerals products. The chemical products used in the index may not be representative of significant price changes because of the large number of new products. More generally, however, only a moderate rate of advance in overall chemical prices might be expected, in part because of fairly small increases in the prices of many of the long-standing industrial chemicals and in part because new products are introduced at relatively high prices and the price trend for them is often downward. This pricing policy is pronounced for synthetic resins and plastics; new products are introduced at prices that often are high relative to those of the established products but the prices of the new products tend to

fall fairly quickly and substantially as attempts are made to enlarge the market for the new-comer in competition with established materials or products.

Some of the factors responsible for keeping the prices of chemical products down in Canada are foreign competition, the competition from substitutes, new technology and improvements in processes of manufacture, the increased scale of operation for some plants as the domestic market expands, the location of new chemical plants closer to consumption centers when a regional market grows large enough to justify the establishment of a plant.

As noted above, it is typical of new products that their prices tend to be high in the initial stages of production, and take a strong dip as soon as the product is established and processes of production are improved. For example, the average domestic selling price of polyethylene, general purpose, declined from 35¢ a lb. in 1959 to 26.5¢ a lb. in 1965; general purpose polyvinyl chloride resin fell from 22¢ a lb. to 16¢ a lb. during the same period; polystyrene resin fell from 25¢ a lb. to 17¢ a lb. and its monomer, styrene, from 13¢ a lb. to 10.5¢ a lb. During the same period the prices of many older established products remained unchanged or showed only a slight decrease. For example, the price of sodium carbonate remained the same from 1959 to 1965 at $2.05 per 100 lb., and that of sulphuric acid declined from $25.35 per ton in 1959 to $22.64 per ton in 1965.

Research and Development

Although much of the basic research is done outside Canada, the chemical industry is highly committed to research and is one of the leading industries in research expenditures in Canada. In 1965, the chemical industry spent $30 million on research and development, about 35 per cent more than that reported in 1963. In 1965, the chemical industry's expenditures on research were the third highest among the nineteen principal manufacturing industries, exceeded only by those of the electrical products and aircraft industries.(1) Canada's chemical industry is reported to spend about 1½ per cent of its sales income on research and development which is, however, less than half the rate of its U.S. counterpart(2) and is below the rate for the industry in many other leading industrial countries. While some of the expenditure on research and development in Canada is for new product research, much of it is for product or process improvement or adaptation to Canadian requirements. Even so, the chemical industry in Canada has made some notable contributions to product and process development. Moreover, some companies spend far more than the average for the industry, as was noted in the 1964 Annual Report of Du Pont of Canada Ltd.

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(1) D.B.S., Industrial Research and Development Expenditures in Canada, 1963; Cat. No. 13-524 and Daily Bulletin Supplement -3, April 12, 1967

(2) American Chemical Society, Chemical and Engineering News, Dec. 13, 1965; Washington, D.C., p. 115

"The chemical industry annually accounts for some 20 per cent of the total funds spent by Canadian industry on research and development. The company's expenditures are at a rate almost twice that of the chemical industry average. Annually, the company spends several million dollars in the search for new or improved products and processes. Close to 90 per cent of this money is spent in Canada, supporting a wide range of research and development activities essential to the health and growth of its business. The balance of these funds is spent outside Canada to purchase technical knowledge not available locally."(1)

It was stated in the public hearing in June 1963 that W.R. Grace and Co. of Canada Ltd. spent from 4 per cent to $4\frac{1}{2}$ per cent of its sales on research and development.(2)

The spokesman for Canadian Industries Limited stated in the public hearing in May, 1961 that:

"C.I.L. has always played its full part in promoting chemical research in Canada. Our expenditures on research in 1960 amounted to $4.5 million, equal to approximately 70 per cent of our profits and to 100 per cent of the dividends paid to shareholders. We are at present expanding our central research station at a cost of $3.5 million. When this program is completed, the company will have some $12 million invested in research and technical services laboratories."(3)

Historically, the chemical industry in Canada has benefited from ample natural resources and relatively inexpensive power. More and more, however, the significant advantages are to be gained by application of research and technology.

According to a spokesman for BASF, a large German chemical company, emphasis on research and development is the main factor for the spectacular success of his company.

"Asked to pick only one single reason chiefly responsible for this spectacular success, Prof. Bernhard Timm, BASF's chief executive, does not hesitate to finger high outlays for research and development as the prime moving factor."(4)

A spokesman before the Board drew attention to the importance of research and development for the chemical industry in Switzerland and noted that:

"A more detailed analysis reveals that Switzerland, with no preferred position on raw materials, has successfully developed dyestuff and pharmaceutical manufacture which contributes largely to the export level of 79 per cent of her chemical production. The Swiss obviously place considerable emphasis on research."(5)

(1) Du Pont of Canada Limited, Annual Report 1964, p. 11
(2) Transcript, Vol. 170, p. 28000
(3) Same, Vol. 35, p. 5198
(4) The Journal of Commerce, New York, December 2, 1966
(5) Transcript, Vol. 169, p. 27832

Another expert on the Canadian chemical industry observed:

> "Any industry which is dependent on licensed or imported technology will lag behind the current state-of-the art, and hence forfeit the rewards which stem from technical leadership. Moreover, it is generally expected that industry must actively engage in research and development in order to assimilate and successfully exploit new technology."(1)

A significant result of this lag in leadership is that by the time the product is introduced in Canada its price in the international market may already have declined. The spokesman for Dow Chemical Canada Ltd. stated at the public hearing: "... but the fact is that whenever we start producing a chemical in Canada it goes on the market at a lower price than it was before."(2)

Some producers of chemicals suggested that increased tariff protection would indirectly encourage expenditure on research and development because of the higher profits which were expected to result. As the spokesman for one major producer of chemicals noted:

> "... You cannot say purely that if you are going to increase the tariffs you are going to increase research, but I think I can say this, that as a resourceful Canadian company which does not get its research done outside the country our research budget was very definitely governed by our gross profit. As tariffs might affect gross profit then I would say they would probably affect the research budget."(3)

There was no suggestion in these observations that this indirect form of encouragement was necessarily the best way for a government to encourage greater research expenditure. The same spokesman, however, also noted one of the limitations to the effectiveness of tax incentives as a means of increasing research and development expenditures.

> "I think the last budget [1962] did bring some more research into Canada which might otherwise have been done in the United States. However, this is a tax incentive, and you have got to earn a gross profit in order to pay the tax, and if you do not earn the gross profit there is no incentive, so you end up really by having the companies which are reasonably profitable and who are probably already doing research, doing a little more research, and you do not run into very many areas where you are going to have a brand new research department started in a company that did not have one before. That has been the experience in the past year."(4)

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(1) Canadian Chemical Processing, October, 1965, p. 66
(2) Transcript, Vol. 39, p. 5864
(3) Same, Vol. 170, p. 28028
(4) Same, Vol. 170, p. 28029

Aid to research in the form of direct grants or other forms of assistance was not discussed to any extent before the Board. However, it is understood that companies in the chemical industry have made use of some of the opportunities available through Federal Government programmes of direct financial assistance; the industry, for example, was reported to have received about 40 per cent of the $4.25 million of grants approved by the National Research Council Committee on Industrial Research Assistance in 1965.(1)

A spokesman for the Council of Forest Industries of British Columbia, as a representative of users of chemicals, observed that "we are not impressed by the argument that an increase in tariff as such is likely to result in any significant increase in Canadian research."(2)

Earnings and Profits

In the course of its study of the chemical industry the Tariff Board collected in confidence considerable information on costs, prices, sales and profits for individual companies and for groups of companies. For describing conditions in the industry in general, however, the published information available from the Department of National Revenue and from the Dominion Bureau of Statistics is used.

The difficulties concerning classification of companies to industrial groups with respect to the financial data are, in some respects, even greater than those referred to above concerning the more general statistics. Differences in the dates of fiscal years and differences in accounting procedures add to the difficulties of getting data that are representative of an industry relevant to this Reference. The fact that many of the largest producers of chemicals are also producers of other products such as textiles or minerals has special significance to earnings and profits because of the variety of ways in which costs and earnings can be assigned to one or another branch of a company's operations. For these reasons, therefore, in this section, even more than in the preceding ones, the description of the industry is only illustrative.

According to D.B.S. data derived from its corporation profits survey, total sales of the Chemicals and Chemical Products Industries in 1966 amounted to $2.6 billion, compared with $1.6 billion in 1961.

Profits before taxes for the Chemical and Chemical Products Industries amounted to $231 million in 1966, or 8.7 per cent of sales, the highest ratio among the major manufacturing industries. The corresponding ratio for total manufacturing was 5.6 per cent. While sales of chemical and chemical products increased by 67 per cent from 1961 to 1966, gross profits before taxes increased by 110 per cent. The 1966 data reflect a somewhat lower ratio of profits before taxes to sales than in 1965 for the chemical industry; however, for the manufacturing industries as a whole, an increase in sales in 1966 was accompanied by a decline in profits before taxes.

(1) National Research Council, Forty-Ninth Annual Report (1965-66), p. 16
(2) Transcript, Vol. 170, p. 28028

In terms of the absolute amount of profits before taxes, the chemical industry ranked fifth in 1965 and second in 1966.

Sales, Profits before Taxes and Profits as a Percentage of Sales, Selected Manufacturing Industries, 1961 and 1966

Industry	1961 Sales (Millions of Dollars)	1961 Profits Before Taxes (Millions of Dollars)	1961 Profits as % of Sales %	1966 Sales (Millions of Dollars)	1966 Profits Before Taxes (Millions of Dollars)	1966 Profits as % of Sales %	1966 Profits After Taxes as % of Sales %
Chemical and Chemical Products	1,582	110	7.0	2,641	231	8.7	4.9
Electrical Products	1,401	41	2.9	2,667	117	4.4	2.3
Food and Beverages	5,176	263	5.1	6,765	366	5.4	2.9
Metal Fabricating	1,690	77	4.6	3,078	163	5.3	2.7
Paper and Allied Products	2,127	255	12.0	2,941	180	6.1	2.6
Petroleum and Coal Products	1,692	109	6.4	3,148	164	5.2	3.2
Primary Metals	1,850	159	8.6	2,862	188	6.6	4.7
Printing, Publishing & Allied Prods.	880	57	6.5	1,281	95	7.4	4.0
Textiles	1,861	67	3.6	2,699	65	2.4	1.7
Transportation Equipment	2,009	127	6.3	5,067	190	3.7	2.2
Wood Products	1,710	72	4.2	2,466	128	5.2	2.7
Total Mfg.	26,012	1,555	6.0	41,596	2,313	5.6	3.2

Source: D.B.S., Corporation Profits, Fourth Quarter, Cat. No. 61-003

When profits after the payment of taxes are considered, the position of the chemical industry is slightly changed vis-a-vis other manufacturing industries and manufacturing as a whole. In 1966, the Chemical and Chemical Products Industries had the highest ratio of profits after taxes to sales, closely followed by the Primary Metal Industries which had been first in 1965. The chemical industry's profits after taxes were 4.9 per cent of sales, compared to 4.7 for primary metals and 3.2 per cent for all manufacturing industries. The chemical industry had experienced a much more pronounced increase in this ratio from 1961 to 1966 than had the manufacturing industries as a whole; in 1961, the ratio for the industry was 3.3 per cent, almost the same as for manufacturing as a whole.

Somewhat more detailed information on earnings and profits is available from the Department of National Revenue publication, Taxation Statistics, but with a greater time lag. From these data, 1963 is the most recent available year. Of 916 producers included in Taxation Statistics in 1963 as primarily producers of chemicals and related products, almost one-half were engaged, to a substantial extent, in the production of goods not within the scope of this Reference. These were mostly producers of pharmaceutical products and soaps and toilet preparations. On the other hand, a number of companies which produce chemicals on a large scale are not included in these classifications.

The operating results of the companies are considered here in terms of the following relationships: the gross profit (or gross margin) as a per cent of sales, profits after income tax as a per cent of sales and profits after income tax as a per cent of net worth. The gross profit, or gross margin, in this context is simply the difference between net value of sales and direct cost of sales, as shown in the Taxation Statistics, making no allowance for such factors as rent, interest paid or capital cost allowances. In other words, it represents the amount available from which to meet administrative, overhead and financial outlays and from which to realize, residually, the net profit on which income tax is paid (See Appendix I). The gross profit, or gross margin, therefore, is considerably larger than the profit on which income tax is paid. In 1963, for example, the ratio of gross profit to sales for the chemical and allied industries in Taxation Statistics was 35.8 per cent compared with 8.3 per cent for net profit before income tax. For all manufacturing, the ratio of gross profit to sales for the 6 years, 1958-1963, averaged about 26 per cent; for chemicals, the ratio averaged 35.7 per cent.

The chemical industry also enjoyed a somewhat higher ratio of profits after federal income tax to sales. In 1963, for example, the ratio was 5.5 per cent for the chemical industry compared with 4.3 per cent for all manufacturing.

The following table shows the gross profits and the net profit after tax as a per cent of sales for all manufacturing and for the chemical industry as a whole and for its major groups as classified in Taxation Statistics.

By combining the data from Taxation Statistics with other information submitted to the Board, a more specialized classification of 106 corporations which are producing principally the chemicals of Reference 120 was possible; these were divided, for 1962 and 1963, into 18 groups on the basis of the type of chemicals produced. This special tabulation revealed very great differences in operating results among the different categories, suggesting that the groups of companies constitute several distinct and diverse industries. The tabulations showed that some producers which had a ratio of gross profits to sales in excess of 30 per cent had a ratio of net profits after tax to sales in excess of eight per cent in those years; these included certain producers of chemical specialties, of some basic resins and cellulosics and some fabricated plastics. While some producers of compressed gases and of soaps and toilet preparations recorded the highest ratios of gross profits to sales, the ratios of their net profit after taxes to sales were of the order of 5 per cent. Producers of paints and pigments

Gross Profits[a] and Profits after Income Tax, as Percentage of Sales,
Chemical Industry and all Manufacturing, Selected Years, 1956 to 1963

Industry	1956		1959		1961		1963	
	Gross Profits	Profits after Income Tax	Gross Profits	Profits after Income Tax	Gross Profits	Profits after Income Tax	Gross Profits	Profits after Income Tax
				- per cent -				
Chemical Group								
Paints and Varnish	40.5	3.3	35.6	4.5	36.4	3.6	35.1	3.5
Soaps and Toilet Preparations	50.5	5.1	41.7	5.6	44.0	5.7	43.9	5.4
Fertilizers and Industrial Chemicals	41.2	6.2	25.8	2.4	25.8	3.3	30.2	4.5
Pharmaceutical Preparations	60.9	7.0	53.5	7.1	51.5	5.5	53.8	6.6
Miscellaneous Chemicals	38.8	4.8	30.2	6.1	30.8	3.8	31.3	6.0
Total Chemicals	44.4	5.3	35.4	5.4	34.8	4.2	35.8	5.5
All Manufacturing	..	4.4	26.5	4.2	26.2	4.1	26.1	4.3

(a) Gross profit is the gross margin between net sales and cost of sales, making no allowance for such costs as rent, interest and capital allowances. (See Appendix I)

Source: Calculations based on Taxation Statistics, Department of National Revenue

also had ratios of gross profits to sales in excess of 30 per cent but the ratio of their net profits after tax to sales was generally about 3 per cent. Fertilizer producers had a ratio of gross profits to sales of about 20 per cent and a ratio of net profits after taxes to sales of about 5 per cent, while pesticide producers, with gross profit ratios of about the same magnitude, recorded net profits after tax considerably lower relative to sales. While some of the largest companies, producers of a wide range of products, experienced relatively low profits in 1962, the ratio of profits after income tax to sales for most of these companies, in 1963, was between 7 and 8 per cent.

As shown in the following table, the net profit after federal income tax as a return on net worth, during the 10-year period 1954-1963, for the chemical industry was, on average, a shade below that in all manufacturing, although in a number of years it was higher. By the special tabulation for producers of products more directly relevant to Reference 120, in 1962 and 1963, the rate of return on net worth on the average was well above that for all manufacturing, though the range for the 18 sub-divisions was very great: from a loss of about 10 per cent on net worth for certain producers of detergent chemicals in 1962 to a profit of 50 to 60 per cent of net worth for some producers of chemical specialties.

Profits by Size of Company

On the average the larger chemical companies enjoyed better profit ratios than the smaller companies. A similar relationship apparently is experienced in other countries.

The overall net profit as a percentage of sales for the chemical industry as a whole, as noted earlier, was 5.5 per cent in 1963. Some examples of the relationship of profit to sales, by size of company, are given in the second table which follows. For the companies with annual sales of a hundred million dollars or over, the ratio, on average, was 6.8 per cent; for companies with sales of $10 to $99.9 million, it was 6.0 per cent, and for companies with sales of under $10 million a year, it was 5.4 per cent (excluding the special case of Jefferson Lake Petrochemical of Canada Ltd. which, in addition to the particular income tax situation noted in the table, benefited from the strong increase in demand for sulphur in the years shown). It should be noted that some of the companies in the table produce substantial quantities of products which are not chemicals.

Some trend towards increase in size is observable not only in new plants such as those producing petrochemicals but also in the integration of companies, particularly through acquisitions. Some of the acquisitions or mergers made public in the press during the past few years were: Canadian Celanese Ltd., Western Chemicals Ltd. and Duplan of Canada Ltd. with Chemcell (1963) Ltd. or its predecessor, Canadian Chemical Co. Ltd.; Richmond Plastics Ltd., Dymer Plastics Ltd. and the plastic cup manufacturing facilities of Caddy Plastics Ltd. with Dow Chemical of Canada Ltd.; the British American Paint Co., Continental Explosives, Montreal Plastics, the Cutler Sulphuric Acid plant, Canadian Arsenals Ltd. and the Campbell Manufacturing Co. with Canadian Industries Ltd.; Shawinigan Chemicals Ltd. with the British American Oil Co. Ltd.; Kayson Plastics and Chemicals Ltd. with Polymer Corporation Ltd.;

Profits after Income Tax as Percentage of Net Worth, for Chemical Industry and All Manufacturing

Year	Paints and Varnish	Soaps and Toilet Preparations	Fertilizers and Industrial Chemicals	Pharmaceutical Preparations	Misc. Chemicals	Total Chemicals	All Manufacturing
				- per cent -			
1954	7.3	9.3	8.6	12.8	5.5	7.2	8.3
1955	6.4	11.2	11.8	11.2	8.5	9.7	10.1
1956	7.4	11.8	9.4	14.9	8.7	9.9	10.2
1957	8.1	10.8	5.4	13.7	7.4	8.7	8.9
1958	7.8	13.9	1.6	14.1	7.3	8.0	7.8
1959	10.7	13.2	4.1	16.4	10.1	10.2	8.6
1960	5.6	15.1	3.6	15.2	7.9	8.3	7.7
1961	8.5	15.3	4.6	13.7	5.2	7.0	7.7
1962	6.5	13.8	8.1	12.6	6.8	8.3	8.9
1963	9.1	14.5	5.7	15.1	9.9	9.6	8.8

Source: Calculations based on Taxation Statistics, Department of National Revenue

Illustration of Sales and Profit Ratios by Size of Company 1963 to 1965

Size Group (In order of 1965 sales)	Net Sales 1963	Net Sales 1964	Net Sales 1965	Net Profit after Tax 1963	Net Profit after Tax 1964	Net Profit after Tax 1965	Ratio of Net Profit to Net Sales 1963	Ratio of Net Profit to Net Sales 1964	Ratio of Net Profit to Net Sales 1965
	($ million)			($ million)			(per cent)		
$100 million and over									
Domtar Ltd.	352.7	386.0	406.8	20.8	25.0	26.6	5.9	6.5	6.5
International Minerals & Chemical Corp.	184.2	225.7	263.0	10.3	15.8	20.3	5.6	7.0	7.7
Canadian Industries Ltd.	184.2	212.2	236.4	7.7	9.7	9.8	4.2	4.6	4.2
Du Pont of Canada Ltd.	146.0	171.9	188.5	14.0	15.6	12.5	9.6	9.1	6.7
Union Carbide Canada	113.4	133.4	145.3	9.7	12.1	13.0	8.6	9.1	9.0
Chemcell Ltd.	(a)	(a)	108.1	(a)	(a)	10.5	(a)	(a)	9.7
$10 million to $99.9 million									
Chemcell Ltd.	80.3	96.7	(a)	8.5	10.6	(a)	10.6	11.0	(a)
Sherwin-Williams Co. of Canada Ltd.	33.0	35.4	36.1	0.8	1.0	.8	2.5	2.9	2.3
Northwest Nitro Chemicals Ltd.	15.4	17.6	22.2	1.1	1.6	2.0	7.5	9.2	9.2
Reichhold Chemicals (Canada) Ltd.	7.6	9.7	11.2	0.3	0.4	0.4	3.3	4.6	3.8
Under $10 million									
Jefferson Lake Petrochemical of Canada Ltd.(b)	4.0	4.6	5.9	0.9	1.4	2.1	23.2	29.5	36.0
G.M. Plastic Corporation	2.2	3.1	4.9	*	0.1	0.1	2.6	4.0	2.7
General Paint Corp. of Canada	(c)	4.6	4.8	0.1	0.2	0.2	-	3.4	3.7
Service Plastic & Chemicals Corp.	4.0	4.1	4.7	0.1	0.2	0.2	3.6	4.5	4.7
New Surpass Petrochemicals	0.6	1.0	1.1	*	*	*	9.9	4.4	3.7
Total of Companies Listed	1,127.6	1,306.0	1,439.1	74.7	93.8	99.0	6.6	7.2	6.9

(a) The company is recorded in the category $10 million to $99.9 million in 1963 and 1964 and in the category $100 million and over in 1965
(b) No income tax required 1963, 1964 and 1965
(c) Not stated

Source: Financial Post, Survey of Industrials

Bradfield Fertilizers and Chemicals with Shell Canada Ltd.; Dominion Fertilizers Ltd. with the Electric Reduction Co.; Imperial Flo-Glaze Paints Ltd. with Du Pont of Canada; Building Products Ltd. and Polybottle Ltd. with Imperial Oil Limited; the Canadian Aniline and Extract Co. with Nopco Chemical Canada Ltd.; and the Polyethylene Bag Manufacturing Co. and Campbell Containers Ltd. with Union Carbide Canada Ltd.

Summary

From the foregoing review of the chemical industry in Canada, it is evident that there is a great array of natural resources and other raw materials available to the industry. The industry has had a rapid rate of growth in the past twenty or twenty-five years and the general underlying conditions would seem to favour continuation of this growth. Even so, a significant part of the domestic market is supplied by imported products, in many instances imported by chemical companies. Of necessity, the Canadian chemical industry and other users will always rely to some extent on imports of newly developed products and, unless export markets can be found, on products for which the domestic demand is insufficient to justify production in Canada. The growth in exports, while also impressive, has taken place to a large extent in less complex products such as sulphur and potash or in products subject to free entry or low rates abroad such as fertilizers and synthetic rubber. On the whole, the chemical industry has maintained a capital expenditure and a profit position more favourable than manufacturing industries as a whole. With respect to research and development, the chemical industry has done well relative to many sectors of manufacturing in Canada, but its performance is not so impressive when compared with research and new product development abroad.

The expansion and growth of the chemical industry has taken place under a tariff structure that has not undergone major revision for several decades. In addition to proposals to modernize classification and terminology, producers of chemicals in Canada generally proposed increases in rates of duty that, in total, would have the effect of adding substantially to the tariff protection accorded to the industry by increases in rates, deletion of end-use items or deletion of other duty-free provisions. Given the complex relationship of products, both in production and use, the industry suggested that the levels of protection be considered in relation to the overall production of chemicals in Canada rather than in terms of the need for protection for one product or another. In general, this seemed to be a reasonable approach, though it did not remove the difficult decisions concerning what tariff structure and rates of duty would most benefit the industry and the country as a whole. The question naturally arose of whether the proposed substantial increase in overall protection was in the best interests of the nation, whether some redistribution of a quantum of protection was in order, or whether, indeed, an overall reduction in protection was called for.

In this regard, certain features of the industry, in addition to its apparent general healthiness and progressiveness, seem particularly relevant. The growth of the industry, while resting to a substantial extent on products of fairly recent origin, was by no means confined to these products. Almost all of the largest companies, as

well as being producers of the newer products, are heavily committed to the production of many long established products. Many of these traditional products are also experiencing substantial rates of growth and contributing significantly to the earnings of the industry. For most of them the case for tariff protection seems less pressing than it might be for some of the more recent, or for the prospective products of the industry. The industry's ability to produce the traditional products has been established and often rests to a very limited extent, if at all, on tariff protection. The overall uniformity of rates of duty, therefore, might very well fail to maximize the effectiveness of a given quantum of protection even for the larger integrated companies for which the uniformity of rates has some administrative and general attractiveness.

The companies frequently adopt the practice of importing the newer products until the domestic market is large enough, or is approaching a size, to warrant their production in Canada. In many cases, it was argued that economies of scale were very significant in the production of these products; often they are part of a processing complex which, typically, involves large capital outlays and very skilled personnel. Often the process used in the Canadian plant is one which has already been proven abroad, frequently in a plant of the parent company of the Canadian producer although the reverse procedure also occurs occasionally. The proposed rates of duty were said to be necessary to offset the lower costs of production abroad, or to otherwise encourage a company to produce in Canada for the Canadian market. Typically, no expectation was expressed that export markets would make a substantial contribution to volume of production and, hence, to economies of scale. However, there are a few notable exceptions: some producers asked the Board not to recommend any increase in the duty on certain of their products lest they be subjected to retaliatory duties in their important market abroad; others, when queried, stated that access to the large market of the United States could assist them more than any Canadian duty.

One problem concerning economies of scale that persists is the propensity within the industry, and at times within a company, to establish two, three or more plants to produce a product even to serve a domestic market which, in total, is represented as being hardly sufficient to maximize such economies. In other words, within the industry itself, other considerations often over-ride the economies of scale. Added to this development is the difficult assessment of the importance of complementary products in the very complex production relationships and of competition and substitution of similar or even of quite different products in the market.

An area of particular difficulty is that of synthetic resins and plastics. The resins which are used in greatest volume often require complex processes of production where economies of scale are most emphasized and where co-product, by-product, competition and substitution relationships are particularly intricate. In addition, because grades and forms of resins often are made specifically for certain uses, there is a substantial market for "off-grade" material which, for technical or commercial reasons, is judged not to be able to serve its intended market but which may be very well suited for another use. It may be sold at a greatly reduced price. Many of the thermoplastics can be re-formed into resin and other basic forms so

that there is a considerable market for scrap material. The producers frequently urged that minimum specific rates of duty be provided for these resins.

On the other hand, new synthetic resins are constantly being developed, usually in other countries. The users of resins in Canada noted that any barriers to access to these new products placed the users in Canada at a disadvantage; these users, therefore, urged duty-free entry, or low rates of duty, for resins which are not available from Canadian production.

Similarly, other users of chemicals frequently opposed increases in rates of duty on their raw materials. Some of these users represent major outlets for the products of the chemical industries; they include, for example, the mining industry, the pulp and paper industry, the food and pharmaceutical industries and the agricultural interests. There also are many producers of specialty chemical products and preparations for whom a major item of cost is the chemical materials which they use. Many of these companies are relatively small, but in total they use substantial quantities of chemicals and are dependent upon the producers of basic chemicals for these materials. The rates of duty on the basic chemicals can have an appreciable effect on their position.

Because of the very complex production and marketing arrangements, it is not easy to assess the effect which a change in the rate of duty on a product may have on its price in the market or on the economy generally. Cases were cited before the Board in which the price of a product in Canada is the same as, or lower than, the price in other countries, particularly the United States, even though there is a duty levied on importations of the product. In other cases, the price in Canada was higher by something less than the full rate of duty would seem to permit; in still other cases the price was higher by an amount that reflected factors additional to the rate of duty. For some products, a producer would indicate that the price was the U.S. price plus duty, exchange and transportation. Users of chemicals also noted situations in which this practice was followed and, in some instances, complained that it placed them under a particular hardship if the producer of the raw material also competed with them by producing the final product.

Such considerations are noted in greater detail in the reports on individual products and in the Summary and Conclusions pertaining to the recommended items.

NOMENCLATURE

To deal with the problem of nomenclature, it is essential to consider further the scope of the Reference. To those learned in the field there appears to be some measure of agreement that chemistry is the branch of physical science which deals with the elementary substances of which all bodies are composed, and with the compounds formed therefrom. The science of chemistry has made tremendous strides. Today more than one hundred elements are known and a hitherto unimagined number of compounds are known and used.

Though chemistry as a science seems to be relatively well defined it is more difficult to define accurately the word chemical as a noun or substantive. Many things may have two or more separate identities: a plastic toy may be a toy in one context and a chemical or plastic product in another; magnesium sulphate may be an industrial chemical or a pharmaceutical stored in the housewife's medicine cabinet under the name of Epsom Salts. For the purpose of this Reference the Board merely concerns itself with those substances obtained from or used in chemical processes and at the same time not excluded from its terms of reference. In drafting the schedule of tariff items the Board has attempted to draw practical lines of demarcation suited to the peculiar circumstances of those cases where such lines seem necessary or useful.

There is little doubt that the progress and expansion of the chemical industry has made the existing nomenclature in the Canadian Customs Tariff outmoded. Names become out of date; products change so that former descriptions no longer adequately apply and substitutes come into use which may be inappropriately classified under existing provisions; products once unknown or insignificant emerge as articles of first importance so that former basket or residual provisions are no longer appropriate. For example, in the course of the hearings, industry representatives were hard-put to give precise meaning to "crude precipitate of copper" or "giant powder", two terms which appear in the Customs Tariff. Many similar illustrations might be cited. Concerning the basket provisions, the Industry Committee presented an estimate that some 1,600 chemical products are classified in major basket items; the Committee pointed out that five of the basket items listed cover respectively 916, 465, 120, 84 and 7 chemicals for a total of 1,592. In volume 3 of the Report the Board lists more than 2,700 chemicals now classified in tariff item 208t and nearly 500 in tariff item 711.

Because of the outmoded nature of the existing nomenclature and because it lends itself only with difficulty to expansion and amendment suitable for tariff purposes, the Industry Committee proposed the incorporation into the Canadian Customs Tariff of a series of items drawn from the Brussels Tariff Nomenclature.

The Brussels Nomenclature is a system, the subject of agreement by many nations, by which goods are classified in Headings which are grouped into Sections and Chapters and, where necessary, subdivided to show the rates of duty applicable to different goods, or classes of goods, under particular Headings. The Nomenclature provides a systematic classification for goods which enter international commerce and is designed to ensure, with the interpretative rules and notes to

Sections and Chapters that each article is classified in one place and in one place only. There are, altogether, 21 Sections consecutively numbered in Roman numerals divided into a total of 99 Chapters, the Chapters being numbered consecutively in Arabic numerals. Under the divisions, by Section and by Chapter, are the headings; these are the tariff items which, in turn, may be subdivided by individual countries as they see fit. The headings are numbered in a double decimal notation in which the first two figures indicate the Chapter in which the heading lies and the second two figures indicate the number of the heading within the Chapter. Thus heading 03.02 is the second heading in the third Chapter and heading 38.19 is the 19th heading in Chapter 38.

The section titles set out certain broad collective concepts under which the more specific, but still collective, concepts of the chapter titles are grouped; within each chapter the headings contain enumerations of the actual goods involved. For example, in Section VI, "Products of the Chemical and Allied Industries", Chapter 29, "Organic Chemicals", Sub-Chapter IX, "Nitrogen-function Compounds", Heading 29.22, provides for "Amine-function Compounds".

An integral part of the Brussels Nomenclature is the section and chapter notes which define more precisely the scope of the headings. There are also five general rules of interpretation to be applied to the Nomenclature.

There are also three volumes of Explanatory Notes to assist in the interpretation and administration of the Nomenclature. These give examples of goods falling within the various headings and illustrate the results of the application of the various section and chapter notes. The Explanatory Notes are subject to more or less frequent amendment in the light of current experience.

In a field of such amplitude and complexity as chemicals and chemical products, it is clear that it would be advantageous to have a system of nomenclature which is clear and logical but subject to amendment without disturbance to the general system of classification. Such a nomenclature would make easier the task of the importer in determining the classification of his products; any uniformity with the practice of other countries would tend to facilitate both the movement of trade and trade negotiations. In all these respects those parts of the Brussels Nomenclature which are applicable to the Reference commend themselves to the Board. It is equally apparent from the submissions made before the Board that they commend themselves also to the industry. No other general arrangement was suggested for the tariff items to be recommended by the Board. Indeed, nearly all of the remarkably few dissenting opinions on this score appeared to be based not upon the nomenclature itself but rather upon the apprehended consequences of its adoption on the rates of duty or on certain other characteristics of the existing Canadian Tariff such as end-use provisions and the special provisions related to manufacture in Canada.

A further advantage in the use of the Brussels Nomenclature exists in the field of statistics. The new Standard International Trade Classifications, Revised - commonly known as "SITC" -, published by the United Nations is precisely correlated to the Brussels Nomenclature. For chemicals and related products, the Dominion Bureau of Statistics is already publishing export and import statistics in a classification closely related to the Brussels Nomenclature.

Because the Board considers the portions of the Brussels Nomenclature relative to this Reference to be eminently suitable and because of the overwhelming support of this view among those who appeared before the Board, most of the Board's Recommended Items and the corresponding headings of the Brussels Nomenclature are either textually identical or very similar; indeed the Board has sought, in its recommendations, to adopt the Brussels Nomenclature to the greatest practicable extent.

In making its recommendations the Board has sought to establish, in the Canadian Customs Tariff, a systematic tariff structure for chemicals; the adoption of a new and revised nomenclature necessarily led to the long and complicated task of classifying the contents of the somewhat haphazard existing chemical items within the items of the Recommended Schedule. This task proved to be exacting and time-consuming for a number of reasons.

There are a vast number of chemicals of some commercial significance; each is somewhat different in its composition, qualities, uses, processes of production, physical form, purity or degree of refinement; many of them are known only to their users or producers.

In addition, the structure of the present tariff made the conversion difficult. In the existing chemical tariff, although there are many items, the larger number of chemicals are classified in a few generally-worded items such as 208t, 216, 220a and 711; two of these include many other things besides the chemicals within the scope of the Reference; tariff item 208t includes all chemicals and drugs, n.o.p., of a kind not produced in Canada and the problem of distinguishing between chemicals and drugs took on particular importance because drugs are not referred to the Board; tariff item 711, the general basket item of the Tariff, includes a great number of chemically defined substances of a kind produced in Canada as well as a large number of undefined chemical substances not enumerated elsewhere, whether or not produced in Canada, and, of course, a multitude of non-chemical products not referred to the Board. Tariff item 220a makes provision for chemical preparations not enumerated elsewhere and whether or not of a kind produced in Canada. Tariff item 216 provides for acids, n.o.p., of a kind not made in Canada. These two items were referred to the Board in their entirety.

From time to time, substances have been ruled to be of a kind produced in Canada, and, accordingly, being excluded from tariff item 208t or 216 and no other provision having been made for them, they have fallen into tariff item 711; less frequently, because of a ruling that they have ceased to be of a kind produced in Canada, a similar transfer has taken place in the opposite direction. Some of the same products, when mixed together in the form of a chemical preparation, are entered under tariff item 220a, whether or not the single chemicals are of a kind produced in Canada. These complex relationships increased the difficulty not only of conversion from the existing to the recommended items but also of distinguishing between products that are properly within the scope of the Reference and those that are not.

Over and above these basket-type items there has developed a great variety of items relating to chemicals; some of these are permanent and some are temporary; a few enumerate chemicals by name; others

describe them more generally; some relate to a specified chemical when imported for a particular use; others relate more broadly to chemicals, or indeed to all goods, when imported for specified uses. Some apply to chemicals of a kind not produced in Canada and some, to the goods enumerated whether or not they are of a kind produced in Canada.

Further problems arose from the fact that the portions of the Brussels Nomenclature, which the Board has followed closely in its recommendations, form consistent and closely integrated parts of the whole Brussels Nomenclature; the existing items of the Canadian Customs Tariff within the scope of the Reference are, on the contrary, closely integrated with the remainder of the Canadian Customs Tariff which differs considerably from the Brussels Nomenclature. In consequence, certain products which form part of the Reference are not included in the chemical chapters of the Brussels Nomenclature and some products which are classified in these chapters are not within the scope of the Reference. For example, the Brussels Nomenclature often excludes from the chemical chapters and treats as minerals, natural chemical compounds derived by non-chemical means, whereas the Canadian tariff often makes no such distinction; for this reason, it has been necessary to make special provisions in the recommended nomenclature for some substances thus derived from natural deposits and excluded from the recommended items derived from the Brussels Nomenclature. For the most part, provision has been made for such substances in various recommended items prefixed by the letter R, usually at the rates recommended for the same compounds when chemically produced. Again, recommended items based on the Brussels Nomenclature include certain extracts refined from animal or vegetable materials but exclude the animal or vegetable materials in their less refined forms, whereas certain existing items of the Canadian Tariff include the animal and vegetable matters and also the extracts derived from them.

A number of problems have arisen relating to products which are not within the scope of the Reference but are nevertheless classified, together with other products that are within the scope of the Reference, in certain Brussels headings the adoption of which has been recommended by the Board; to preserve the uniformity of the recommended nomenclature, the Board has, in many cases, by a process of mere relocation, recommended classification of these products which lie outside the scope of the Reference within the new recommended items without change in the rates of duty. In still other cases, the Board has deemed it necessary to recommend certain items somewhat different from the Brussels headings which were their source; for example, Recommended Items 15.10, 31.00, 38.17, 38.19, 39.03, 39.06 and some others are not identical with the corresponding Brussels headings.

Beyond the foregoing problems relating to the task of establishing correspondence between two differing nomenclatures, there were further problems related to nomenclature to which the Board had to give consideration: problems concerning the provision of rules and notes for the nomenclature, the provision for amendment to the nomenclature, and the treatment of provisions not consistent with the structure of the Brussels Nomenclature but which the Board regarded as desirable in the Canadian Customs Tariff.

The Board is not recommending the full adoption into our Customs Tariff law or administration of the five general interpretative rules, the section notes, the chapter notes nor the Explanatory Notes. Were the Board to urge the adoption of these rules and notes, together with such amendments as may be made thereto in the future, it might be said to be urging the adoption of a status in which the Tariff, in the future, would be determined or modified in some degree by an extra-territorial authority; this objection would not stand in the way of the adoption of the rules and notes in the form in which they existed on the 1st of January 1965 nor of subsequent amendment by competent Canadian authority. However, quite apart from this particular objection, the statutory adoption of the rules and notes into our law or administration is undesirable when only a small part of the Customs Tariff would be based on the Brussels Nomenclature while the rules and notes are written in the context of an entire Customs Tariff in the form of the Brussels Nomenclature; such adoption would conflict with other parts of the existing Tariff and other recommendations by the Board. Moreover, some flexibility will be required in integrating the Recommended Schedule based on the Brussels Nomenclature into the Customs Tariff and in making necessary adjustments between the two forms of nomenclature in a field which is changing rapidly and unpredictably.

Because of the broad degree to which the Brussels Nomenclature has been adopted by other countries, in whole or in part, and because of its suitability for the specially difficult problem of classifying the products of the chemical and allied industries encompassed by the present Reference, the Board does envisage such reference to the Explanatory Notes as may assist in the clarification of difficult or disputed issues. The Explanatory Notes were, of course, drafted in the context of a complete Brussels Nomenclature while the Board's recommendations deal only with one segment of the Tariff: chemicals. In consequence the Explanatory Notes, in the circumstances, would not possess all the cogency and authority they would have in relation to a complete tariff in the form of the Brussels Nomenclature; they would have to be considered in the light of the special circumstances of the case: considerations of a general nature relating to the Canadian Customs Tariff, principles of broad application arising from Parliamentary enactment or from decisions of the Board and the courts, the effect of other items in the Customs Tariff and the application of certain principles such as end-use.

The same guiding principles would apply in the same manner to the five General Rules, to the Section Notes and to the Chapter Notes. They too will be useful guides -- cogent ones, at times -- in interpretation and administration; however being no part of our law they can never override our domestic law or come seriously into conflict with it.

The Board recognizes that provisions similar to the section and chapter notes and interpretative rules are essential to the administration of the Customs Tariff; the Explanatory Notes also are a useful guide in interpreting recommended items derived from the Nomenclature. Consequently, on page 30 of Volume 1, the Board has recommended an amendment to Section 2 of the Customs Tariff empowering the Governor-in-Council to prescribe rules and explanatory notes to serve as an aid in the interpretation of the new Recommended Schedule. This recommendation was designed to ensure that reference could be made to the Brussels publications without conflict with the remainder of the Customs Tariff.

It would permit necessary revisions to be made readily to the interpretation of this section of the Customs Tariff; these revisions could include the acceptance, in whole or in part, of future changes in the Brussels rules and notes as long as they suited Canadian purposes; it would also permit departure from the Brussels rules and notes where they are unsuitable. It would further enable publication in convenient form of rules and notes suitable for the administration of the Recommended Items.[1] Amendments to the items themselves would be made in the usual manner.

As mentioned before, most of the Board's Recommended Items are textually identical or very similar to existing headings of the Brussels Nomenclature. To assist in reference to the Brussels Nomenclature, the Board has designated, for convenience only, the Recommended Items by the double decimal number descriptive of the Brussels Heading from which the text of the Recommended Item is drawn. In those cases where the Recommended Item is not drawn from the Brussels Nomenclature the Board has used the capital letter "R" followed by Arabic numerals: R-1, R-2, R-3, etc.

(1) Appendix III to this volume contains, by way of illustration, certain draft rules and notes prepared by a technical committee for further consideration

DISTINCTIONS BETWEEN PRODUCTS MADE AND NOT MADE IN CANADA

On pages 17 and 18 of Volume 1 the Board dealt briefly with the distinction between products of a kind produced in Canada and those of a kind not so produced. There are a very large number of products to which the distinction now applies and, also, to which proposals for its application were made. To deal with the issue in relation to individual products would involve endless repetition. Consequently the Board sets out here such amplification as is necessary to what was written in the Prefatory Note to Volume 1.

The extent of the application of the class or kind distinction to establish different rates for chemicals when produced in Canada and when not so produced raises certain broad considerations. The distinction and the discrimination in rates already exist in some of the items dealing with chemicals and elsewhere in the Customs Tariff. The Board intends such recommendations as it may make on this score to apply narrowly within the limits of that portion of the Customs Tariff which lies within its terms of reference.

The distinction between products of a class or kind produced in Canada and those not so produced is usually made for one or more of three purposes. The first is the determination of the applicability, under Section 6 of the Customs Tariff, of special or dumping duty which, under subsection (1) of the section, applies only in the case of goods exported to Canada which are "of a class or kind made or produced in Canada". The second is the determination of the applicable rate of duty when the Tariff establishes a difference in rate on the basis of the distinction. The third is the determination of the applicability of drawback where the drawback item involves the same distinction.

In many of the tariff items in the Reference the distinction is made by the use of the words "of a kind not produced in Canada"; for example, tariff items 208t, 216, 263c and 921. Throughout the Customs Tariff there is also frequent use of the phrase "of a class or kind" followed by the qualification "made in Canada" or "not made in Canada".

The Industry Committee and many members of the industry sought to avoid the use of either the phrase "class or kind" or the word "kind", advocating, in lieu of either, the use of the word "class" in order to broaden the protection afforded the chemical producers. In support of this position quite lengthy representations were made.

The administration in the field of chemicals of the distinction between products made and not made in Canada was represented as different from the administration in the field of machinery; in the field of chemicals it was represented that the interpretation of the word "kind" is narrowed to the concept of identity whereas in the field of machinery, the interpretation of the words "class or kind" involves a broader concept more akin to a rather general similarity; the narrower concept was said to impose hardship on the producers of some chemicals; in the field of mixtures and blends, in particular, it was urged that it could not be administered effectively to protect Canadian production according to the intent of the legislation.

There was a plea for change in the field of mixtures and blends; one submission stated that the method of production could have a bearing on tariff classification; thus a blend resulting from a chemical reaction is classified as a "chemical" in tariff item 208t whereas, if the same blend were obtained by mixing the chemicals together, the product would be classified in tariff item 220a as "chemical preparations". The presence in the product of even a very small amount of another substance produces differences in classification according to its origin; if it was merely left as a residue after the chemical reaction bringing the product into being, the product, including the residue, is classified as a "chemical" in tariff item 208t; however, generally speaking, if it was added to the product after the chemical reaction, the product, including the additive, is classified as a "chemical preparation" in tariff item 220a.

Though this issue might appear to be a mere classification problem divorced from the distinction between goods of a class or kind made in Canada or not made in Canada, the problem is related to the distinction because tariff item 208t is restricted to chemicals "of a kind not produced in Canada" while tariff item 220a is not; consequently exclusion or inclusion in item 208t involves exclusion or inclusion in the "kind not produced in Canada".

Furthermore, it was argued that, because "kind" is interpreted to include only identical products, foreign producers could readily defeat the purpose of the Tariff: by minimal variations in proportions which would not alter the product's suitability for a given use, they could remove a product from the "kind" classification of the domestic product.

For effective protection of the Canadian industry in this area two things were urged as necessary: a broader interpretation than that of identity of product for the differentiation between chemicals produced in Canada and those not so produced and the rapid procurement of rulings that products are or are not made in Canada by whatever words the differentiation might be described.

To broaden the administration to cover general similarity and competitive substitutability with Canadian products it was proposed to delete the phraseology: "of a kind not produced in Canada" and to substitute for it the words: "of a class not made in Canada". The interpretation of "competitive" is itself very difficult not only as it applies among different chemicals but also as it applies between chemicals and other products.

The criterion of substitutability - or competitive substitutability as it was often described - was clearly the determinant sought by the industry as opposed to that of identity. This criterion is difficult to apply equitably to a chemical competitive with one or more others in some uses and competitive with none in other uses.

One of the objectives of the proposed change in wording was to bring about a change in basic administrative approach; today many single chemicals are entered under the lower rates applicable to a kind not made in Canada unless it is established that they are so made; under the proposals such chemicals would be entered under the higher rates applicable to a class made in Canada unless it were established that they were not so made.

The objectives and proposed methods of the Industry Committee appear clearly from the following quotation:

"2. If there are 'made in Canada' items for which different rates are determined to be desirable, this list should be specifically recommended by the Board.

"3. To provide a mechanism for establishing lower rates of duty on 'not made' chemicals, the Board should recommend a statutory item, to provide authority for an administrative body to designate chemicals to be dutiable at rates (including free) lower than the normal statutory rates. A proviso that goods may not be designated as dutiable thereunder unless 'not made in Canada' should govern this item. It should also be provided that no chemicals can be designated as qualifying for reduced duties or free entry under this procedure unless the administrative authority gives advance public notice which will provide opportunity for representations to be made by interested parties."

For the designation of goods to be of a class not produced in Canada two conditions were urged:

1. At least 30 days' advance notice of consideration for such designation to provide opportunity for representations by interested parties;

2. Publication of the designation itself.

For cancellation of a designation when the goods become of a class produced in Canada corresponding conditions were suggested.(1)

Under the proposal there would be vested in the administrative authority not only the right to determine the chemicals which are of a class or kind not made in Canada, but also the right to reduce or not reduce the rate after hearing representations. Furthermore, as soon as the administrative authority determined that a chemical had become made in Canada, it would automatically be removed from the list of chemicals enjoying the lower rates; indeed, still further, the chemical could be removed from the list for reasons other than its production in Canada.(2)

There are, therefore, three broad issues which the Board must consider: the establishment of an administrative body to determine which chemicals of a class not made in Canada are to be entered at a lower rate, the broadening of the "made in Canada" provision by substitution of the word "class" for the word "kind", and the extent to which, in the field of chemicals, separate tariff treatment should be provided for goods of a type made in Canada and those not so made.

The proposal for the establishment of a special body to determine administratively whether particular chemicals are either of a type made in Canada or of a type not made in Canada, is one which the Board does not recommend for adoption.

The Board's terms of reference are restricted to that portion of our Customs Tariff relating to chemicals; they do not extend to broad recommendations covering the whole field of the various forms

(1) Transcript, Vol. 166, p. 25604
(2) Same, Vol. 166, p. 25582-3

of distinction related to manufacture or production in Canada. Because of the presence of these distinctions in many places throughout the whole Customs Tariff it appears highly imprudent to the Board to recommend the establishment of a new administrative body for chemicals only. This course could lead to conflict and confusion between rulings in different parts of the Tariff. Because of its terms of reference the Board has not considered the proposal in the light of all the other parts of the Tariff where the class or kind distinctions are made. Furthermore it is not clear to the Board that for the Tariff as a whole, such an administrative body is not already in operation: The Department of National Revenue, Customs and Excise.

In the Introduction to Volume 1, on page 16, the Board has already stated that it envisages that changes arising from the initiation of Canadian production would be made as required through proposals laid before Parliament from time to time. It naturally also envisages such inquiry and determination as the Minister may deem necessary for this purpose - an inquiry and determination quite different in nature from the Industry Committee's proposal for the establishment of an administrative body to determine classification.

In substitution for the phrase "of a kind not produced in Canada" the Board is not recommending the phrase "of a class not produced in Canada" urged by the industry.

In its consideration of this problem the Board is directing its attention only to the portion of our Customs Tariff dealing with chemicals; it is therefore reluctant to attempt to introduce into our Tariff the word "class", with a rather special meaning involving both quite broad similarity and competitive substitutability, when it is so frequently used elsewhere in the Tariff with a meaning that may not be the same. Words used by the legislator should have the same meaning throughout a statute. To attempt the substitution of "class" for "kind" in order to introduce a special concept in a restricted area is fraught with double peril: it may have undesired effects elsewhere in the Tariff or it may fail in its purpose because of the remainder of the Tariff.

Furthermore the Board is reluctant to introduce so broad and nebulous a criterion as competitive substitutability; it has already mentioned the administrative difficulty of applying it to chemicals competitive with others in one part of their use and competitive with none in another part of their use; this difficulty would be increased by the inevitable conflict of views on the facts of the competitive issue; in many cases in the course of the Board's inquiry a product was viewed by the producer as suitable for a purpose and by the consumer as unsuitable for the same purpose; in these conflicts there were cases where the differing conclusions were reached objectively for sound technical reasons, but there were other cases in which the conclusions were reached on more nebulous bases. These conflicts would be productive of issues serving only to plague and distress both the taxpayer and the administrator.

The industry's broad proposal involves as a general rule, uniform rates of 15 p.c., B.P., and 20 p.c., M.F.N., unless there is special reason for variation; in some cases different rates are proposed without qualification; in relation to the class or kind

distinction there was a very large number of cases where lower rates were proposed for products not now made in Canada, subject to revision upwards, usually to the oft-repeated 15 p.c. and 20 p.c., when Canadian production came into being.

The present Tariff makes very broad provision for the application of higher rates of duty to chemicals which come to be made in Canada. Over the years, as the chemical industry has increased in maturity, the application of these provisions has raised the level of duties on a great many chemicals. It was suggested repeatedly that the application of these higher duties would not tend to raise permanently the prices of the protected chemicals because, or so it was suggested, a rate high enough to ensure the whole of the Canadian market to the domestic producer would tend to increase the size of the market available to him and in consequence, to allow him to produce on a larger scale and at less cost. Even when imports have been excluded, however, prices usually have not been reduced to the level prevailing in those countries from which competition would be most likely to come.

True, the prices of some chemicals produced in Canada are lower, sometimes considerably lower, than in those countries from which competition is most probable, but the relatively low costs and prices of these chemicals seldom appear to have been dependent on the existence of a high tariff or on their securing the whole of the Canadian market; rather, it has occurred, in some cases such as sulphur or sulphur dioxide, because of the availability of materials in suitable form and, in others, because relatively low rates of duty elsewhere (especially in the United States) have enabled Canadian plants to produce economically in the larger amounts demanded by world markets, e.g., synthetic rubber, calcium cyanamide, fertilizers and sodium azide.

Generally speaking, however, it would appear that in many parts of the chemical industry the spread of higher rates resulting from the application of the made-in-Canada provisions has tended to raise the level of costs in Canada not only in the other industries which use chemicals but in the chemical industry itself.

The automatic application of higher rates to chemicals which come to be produced in Canada appears not infrequently to have had the further unintended effect of increasing costs by encouraging duplication of productive facilities. Usually, Canadian demand for a chemical while it is not produced in Canada is supplied from abroad by more than one company, of which each has come to occupy a part of the Canadian market. When the total Canadian market grows to a size which would absorb a reasonable proportion of the output of a plant of minimum size, one of the companies may be tempted, partly by the prospect of a higher rate of duty when it begins substantial production, to construct such a plant in Canada. In these circumstances, each of its competitors may be forced to choose between giving up its Canadian business because of the higher duty and, itself, erecting a plant in Canada. If other plants are built, the cost of production in Canada is likely to be increased for a considerable time to come: immmediately by the excess capacity and, in the longer run, by the division of the market between several plants, each of less than optimum size. The strength and prosperity of the Canadian economy is seldom advanced by such cost-increasing inducements.

The Board is also aware of the difficulties which beset the administration of a class or kind distinction in the field covered by this Report. There is the constant struggle between the domestic producers and the importing consumer to bring about an administrative situation of advantage. Apart from factual considerations, this conflict involves tendentious arguments to move the administrative decision one way or another; it bedevils the administration at all levels and beyond it, the courts as well; it is a fertile source of dissension, perplexity and expense.

For these reasons, as well as the dissatisfaction arising out of the existing provisions, the Board's recommendations are made without provision for administrative class or kind distinctions; where they already exist, the Board has not recommended their continuation; where they do not already exist, it has not recommended their introduction.

However, for those products which were of a type made in Canada when the Report was completed, rates of 10 p.c., B.P., and 15 p.c., M.F.N., have usually been recommended; for other chemicals, provision has frequently been made, at recommended rates of Free and 15 p.c. under the two principal Tariffs. In both cases, these rates would maintain the existing margins of preference.

Thus, if the Recommended Schedule is introduced, it will no longer be necessary to distinguish administratively between chemicals of a kind not produced in Canada and other chemicals. In any event, under the Most-Favoured-Nation Tariff, the rate of 15 p.c. is frequently recommended both for chemicals that are of a type made in Canada and for those that are not.

END-USE

On page 18 of the Introduction to Volume 1 of the Report, the Board dealt briefly with the subject of end-use tariff items which grant free entry or special rates of duty on the goods they enumerate when imported for specified uses. There are 113 such items with which the Board has dealt. The total of 113 requires four qualifying comments; firstly, the tariff item now renumbered to be 21600-2 is counted twice, once as Ex. 216 and once again as Ex. 711; secondly, the tariff item now renumbered to be 22005-2 is counted twice, once as Ex. 220a(i) and once again as Ex. 711; thirdly, a further extract from tariff item 711 has now been replaced by the almost identical tariff item now renumbered 86500-1, and each has been counted as a separate item; fourthly, where tariff items, such as 219a and 219d, are divided into paragraphs (1) and (2), each paragraph is counted as a separate item. Of these 113 items, two which are not within the scope of the Reference would be relocated without other change. Ten, which are now expired or cancelled, would be allowed to remain so in the absence of a recommendation to the contrary. Six are recommended for deletion because they are no longer used. Two were the subject of Recommendations in the Board's Report on Reference 133 - Machinery, Apparatus, Printing Plates and Related Products for the Printing and Allied Industries. Eighteen are recommended for deletion because free entry without end-use qualification is recommended for the goods classified in them; two are recommended for deletion because the same rates without end-use qualification are recommended for the goods classified in them; four are recommended for deletion because lower rates without end-use qualification are recommended for the goods classified in them. Five end-use items dealing with pesticides are recommended for deletion because the products enumerated therein would be subject to free entry for use as pesticides in Recommended Item 38.11. A further 41 items are also recommended for deletion. Twenty-three end-use items are recommended for retention: fourteen with some change or modification and nine without change. Six new items related to end-use are recommended.

The opponents of end-use, largely the producers of chemicals, represented it as productive of anomalies and inconsistencies. Their case was that it brought about a serious dilution of protection; it discouraged Canadian production of the goods subject to the lower rates; it lent itself to unnecessary perpetuation, even if justified at the outset, and in such cases came to benefit industries for which it was not originally intended; it frequently operated to eliminate British preferences. They deplored the establishment of end-use without consideration of Canadian production of like goods and noted the opportunity for fraud where only part of an importation was destined to a particular end-use. It was urged that, where some importers may enter goods free of duty while others must pay duty on like goods, there is selective penalization whereby those paying the higher rates subsidize those receiving what was termed special treatment; this may be so, but the general intention of any protective tariff might perhaps equally be described as discriminatory. The opponents did concede that there were very exceptional cases in which end-use treatment was justifiable; however they argued that the treatment should exist only if the objective could be attained in no other way. If there had to be an end-use item it should be specific in content, limited in duration and fully justified; to them the least desirable type of item was the one providing end-use treatment generally for unspecified or unnamed materials, whether or not of a kind produced in Canada.

The proponents, largely the beneficiaries of reduced rates on certain chemicals for specified uses, naturally presented the issues in a very different light. Their natural objective was that of lower rates whether through end-use provisions or otherwise. To them, end-use was a vital principle of Canadian tariff policy the practical usefulness of which was well proven over the years; it should be retained where it is of benefit to the country; indeed they pointed out the phenomenal growth of the chemical industry in the presence of existing end-use provisions as evidence that the industry's apprehension was unfounded. They viewed end-use as a necessary help to certain industries; it enables exporters to compete on more equal terms in foreign markets; for certain interests, such as agriculture, it is administratively impractical to replace it by provisions for export drawbacks. They considered export drawback provisions as insufficient, in many cases, because of the need to compete in the domestic market as well, in order to lower their costs by increased production; the importance of this situation was specially stressed where, as a result of national policy, imports competitive with their products are admitted free of duty or at low rates. They argued that abolition of end-use would result in price increases at the expense of the user and should never take place to encourage either uneconomic production or undue profits. They feared that elimination of many existing end-use provisions would subordinate them to the position of a captive market for the chemical industry, and they feared that the specific enumeration proposed would be too restrictive in a field of rapid technological change. They urged the benefits accruing to large industries like agriculture and the forest industries, to exports and to employment as a result of end-use. They feared the threat of retaliation should many end-use items be eliminated and represented that elimination would often merely increase costs without directing purchases to Canadian producers. They found nothing wrong in discriminatory rates if the national interest is served thereby and advocated retention or introduction of end-use provisions where they would be beneficial.

The divergence of view between the two groups is clear; indeed the subject was one of the controversial issues of the Reference.

The end-use treatment is spread throughout the Canadian Customs Tariff. The Board's recommendations are of necessity confined to that portion within its terms of reference. They do not encompass any broad concept of abolition, continuation or initiation of end-use generally.

Throughout the Report, particularly in those parts dealing with tariff classification, end-use treatment raised constant problems. Many end-use items encompass a great variety of goods which may be classified in a great many tariff items; this situation is particularly true of end-use items relating to "articles", "chemicals", "chemical compounds", "chemical preparations", "compounds", "materials", "preparations" or other similar broad terms. Constant reference to all end-use provisions throughout the text of the Report would involve a tremendous amount of repetion and a great lengthening of the text. Consequently, though there are many brief references to end-use provisions throughout the text of the Report, the Board introduces the note of caution that it has not generally and repetitively treated the matter; it has rather sought to deal with the matter in this section.

Imports of chemicals and related products of Reference 120 are estimated to have been valued in 1966 at approximately $550 million of which about $206 million, some 37 per cent, was under end-use items. Of this $206 million, $184 million, or nearly 90 per cent, was entered duty-free; the balance was dutiable at an average rate of less than 9 per cent. This rate is well below the average for all dutiable chemical imports, indicating the relatively preferred position of imports under end-use items. More than 80 per cent of the imports under the end-use items were from the U.S.A.; less than 5 per cent was from the United Kingdom. One-third of the imports under the end-use items was for agricultural use (fertilizers and pesticides); materials for use in the manufacture of plastics and synthetic rubber accounted for one-quarter of the imports and materials for dyestuffs, pigments and paints, for about one-seventh. The remainder, just over one-quarter of the imports under the end-use items, was for a large variety of uses such as the manufacture of detergents, adhesives, catalysts, additives for oil and gasoline and for such other industrial uses as refining petroleum, concentrating ores, the manufacture of alloys, electric light filaments and so on.

At the hearings, the Board did not adopt any initial position in the controversy over end-use items. However, in its subsequent approach to the problem of end-use it has sought to reduce the number of end-use items within the Reference.

Though it has sought deliberately to reduce the number of end-use items within the Reference, the Board would not seek by its recommendations on this score to oppose the re-instatement of some of the end-use items, including temporary items, where good cause is shown. There may be some cases where fuller evidence than that made available to the Board reveals greater need, less harm and a balance of convenience not known to the Board or where the elimination or change in a British preference might need to be similarly treated.

In more detail, the Board's recommendations relating to end-use items follow.

For uniformity of nomenclature two end-use items outside the scope of the Reference have been relocated without change in rates. The first is tariff item *40, now reproduced in Recommended Item 25.01(2). The second is tariff item *90f; that part of the item dealing with vegetable materials for use as flavourings would be continued in Recommended Item R-1 *90f; the part of the item dealing with vegetable colouring materials for use as edible colourings would be continued in Recommended Item 32.04(2).

Ten items within the scope of the Reference have expired or been cancelled since they were referred to the Board:

157e - Isopropyl alcohol, for use in the manufacture of powdered pectin, carragheen and sodium alginate ... per gallon

Free	5 cts.	25 cts.

208h - Paraphenetidin for use in the manufacture of acetophenetidin

Free	Free	25 p.c.

208z - Acetyl acetone for use in the manufacture of sulpha drugs

Free	Free	25 p.c.

209f - Materials and parts, entering into the cost of cyanide of calcium, cyanide of potassium and cyanide of sodium, for use in the manufacture of cyanide of calcium. cyanide of potassium and cyanide of sodium

Free	Free	Free

210f - Materials, for use in the manufacture of chromium oxide

Free	Free	20 p.c.

220g - Electrode paste (Soderberg type) for use in the manufacture of pig iron

Free	Free	25 p.c.

585b - (until 31st Jan., 1959) - Coke oven light oils for use in the manufacture of benzene and other related aromatic hydrocarbons ... per gallon

1/3 ct.	1/3 ct.	25 p.c.

- (until 31st Jan., 1963) - Black liquor skimmings for use in the manufacture of tall oil

Free	Free	25 p.c.

Ex. 711 - Higher fatty alcohols, unsulphated, when imported by manufacturers of synthetic detergents for use exclusively in the manufacture of synthetic detergents in their own factories ... per gallon

1/3 ct.

(This Extract has been substantially replaced by tariff item 865 now renumbered 86500-1)

866 - Monoisopropanolamine for use in the manufacture of lauryl isopropanolamide

Free	Free	25 p.c.

867 - Monoethanolamine for use in the manufacture of synthetic detergents

Free	Free	25 p.c.

In accordance with its attempt to reduce the number of end-use items in the Reference, the Board has made no recommendation to revive any of these items.

Six of the existing end-use items are recommended for deletion because they appear to be no longer of use:

157 - Ethyl alcohol, when imported by the Department of National Revenue, or by a person licensed by the Minister, to be denatured for use in the arts and industries, and for fuel, light and power, to be entered at ports prescribed by regulation of the Minister, subject to the Excise Act and to the regulations of the Department of National Revenue

Free	Free	Free

158b - Mixtures of methyl alcohol and other ingredients, when imported by tanners for use exclusively as a solvent for dyes for the dyeing of leather in their own factories .... per proof gallon

5 cts.	5 cts.	20 cts.

208w - 2. Crude bromides for the production of bromine

Free	Free	Free

216i - Nicotinic acid when imported for use in the manufacture of nicotinic acid amide and when imported for use in the manufacture of diethylamide of nicotinic acid

Free	Free	25 p.c.

490 - Platinum retorts, pans, condensors, tubing and pipe, and preparations of platinum, when imported by manufacturers of sulphuric acid for use exclusively in the manufacture or concentration of sulphuric acid in their own factories

Free	Free	Free

809 - Cocoa residues, containing not more than five per cent by weight of fat, when imported by manufacturers of chemicals for use in the manufacture of theobromine and caffeine, in their own factories

Free	Free	Free

On two end-use items no recommendation is made in this Report because they were the subject of recommendations by the Board in Reference 133 - Machinery, Apparatus, Printing Plates and Related Products for the Printing and Allied Industries:

660a - Synthetic resin or cellulose plastic sheets or plates, coated or not, with or without turned edges, for the production of engravings for use by printers

Free	$7\frac{1}{2}$ p.c.	30 p.c.

660b - Plates, curved or not, consisting of a layer of cellulose plastic composition and metal, coated or not, for the production of printing plates

10 p.c.	10 p.c.	30 p.c.

Among the end-use items recommended for deletion are eighteen items or parts of items in which the enumerated goods are subject to recommended free entry without end-use qualification:

203 - (in part)	...; iron liquor, being solution of acetate or nitrate of iron adapted for dyeing and calico printing; red liquor, being a crude acetate of aluminum prepared from pyroligneous acid and adapted for dyeing and calico printing	Free	Free	Free
203b -	Aniline and coal tar dyes, adapted for dyeing, in bulk, or in packages of not less than one pound weight	Free	Free	10 p.c.
203c -	Solutions of aniline dyes with or without dissolving salts, adapted for dyeing, for use in Canadian manufactures	Free	Free	10 p.c.
203e -	Coal tar bases or salts in solvents for use in the manufacture of coal tar dyes in the dyeing of textiles	Free	Free	25 p.c.
208i -	Nitrate of ammonia, when imported for use in the manufacture of nitrous oxide	Free	10 p.c.	25 p.c.
216d -	Diacetoneketogulonic acid for use in the manufacture of ascorbic acid	Free	Free	25 p.c.
*216f -	Monocalcium citrate in a water slurry for use in the manufacture of citric acid and salts thereof	Free	Free	25 p.c.
220d -	Chemical preparations, dry, compounded of more than one substance, when imported by manufacturers of fluorescent lamps or electronic tubes for use exclusively in coating the inside of fluorescent lamps or electronic tubes, in their own factories	Free	5 p.c.	25 p.c.
*246e -	Daylight fluorescent pigments, dry, without admixture, for use in Canadian manufactures	Free	Free	$22\frac{1}{2}$ p.c.
247b -	Pearl essence, when imported by manufacturers of imitation pearls, for use only in the manufacture of such articles in their own factories	Free	Free	30 p.c.

263a -	Coal-tar benzol, when imported by refiners of crude petroleum for use exclusively in blending with gasoline wholly produced in Canada	10 p.c.	10 p.c.	25 p.c.
263d -	Ethylene dibromide and sodium for use in the manufacture of tetraethyl lead, tetramethyl lead, mixed ethylmethyl leads, and compounds of all the foregoing	Free	Free	25 p.c.
476b - (in part)	...; ethylene; ...; all the foregoing of a class or kind not made in Canada, and complete parts thereof, for the use of any public hospital, under such regulations as the Minister may prescribe	Free	Free	Free
590 -	Naphtha, high flash, for use in Canadian manufactures ...... per gallon	1/3 ct.	1/3 ct.	1 ct.
664(1) -	Crude glycerine, when imported by manufacturers for use only in their own factories in the manufacture of refined glycerine	Free	Free	Free
681d -	Residues resulting from the processing abroad of uranium metal, salts or oxides of Canadian origin, for use in Canadian manufactures	Free	Free	25 p.c.
689 -	Charcoal, animal, for use in the refining of sugar	Free	25 p.c.	25 p.c.
924a -	Bars, rods and profile shapes of uniform cross-section of cellulose plastic, except cellulose nitrate, when imported in lengths for use in the manufacture of hand tools	10 p.c.	10 p.c.	25 p.c.

They are listed below with the Recommended Items which would provide the free entry for the products enumerated in the existing items; the part of existing item 203 which would be subject to free entry under Recommended Item 38.12(3) as prepared mordants is that part relating to iron liquor and to red liquor:

203 (in part)	:	38.12(3)
203b	:	32.05(1)
203c	:	32.05(1)
203e	:	38.19(6)
208i	:	31.00(2)
216d	:	29.16(12)
*216f	:	29.16(22)
220d	:	32.05(1), 32.07(4)
*246e	:	32.05(1), 32.07(4)
247b	:	32.09(2)
263a	:	29.01(3)
263d	:	28.05(3), 29.02(9)
476b for "ethylene" only	:	29.01(11)
590	:	R-29 590
664(1):	:	15.11(1)
681d	:	R-34 681d
689	:	38.02
924a	:	39.03(g)1

A further two end-use items are recommended for deletion because the existing end-use rates are recommended without end-use qualification for the products they enumerate:

207c - Ethylene glycol, and mixtures of ethylene glycol and other glycols in which ethylene glycol predominates, for use in the manufacture of anti-freezing compounds

10 p.c.	10 p.c.	25 p.c.

208d - Calcium chloride, not in solution, for road-treating purposes only

Free	15 p.c.	15 p.c.

They are listed below with the relevant Recommended Items:

207c	:	29.04(5), 38.19(9)
208d	:	28.30(1)

Four existing end-use items are recommended for deletion because the rates recommended for the enumerated products without end-use qualification, are lower than the existing end-use rates:

220c - Gasoline anti-oxidents for use in the production of gasoline

15 p.c.	20 p.c.	25 p.c.

*220h - Mixtures of formaldehyde, methyl alcohol and the hemi-acetal of methyl alcohol for use in Canadian manufactures

20 p.c.	20 p.c.	30 p.c.

296c - Magnesium carbonate, imported for use in the compounding or manufacture of rubber products

Free	27½ p.c.	30 p.c.

761 - Collodion and emulsions thereof, iodizers for collodion, and stripping solutions, when imported for use exclusively by photo-engravers, lithographers, rotogravure printers, or engravers of copper rollers, in their manufacturing operations

15 p.c.	$17\frac{1}{2}$ p.c.	$17\frac{1}{2}$ p.c.

They are listed below followed by the relevant Recommended Items:

220c:	29.06(1), 29.06(3), 38.14(1)
220h:	38.19(1)
296c:	R-20 296b(2), 28.42(1)
761:	37.08, 39.03(b), 39.03(d)

The recommendations relating to the goods mentioned in the preceding three paragraphs will be found in the Summaries and Conclusions dealing with the appropriate Recommended Items in Part I of this Volume 4.

Five existing end-use items dealing with pesticides are recommended for deletion because the products enumerated therein are now recommended for free entry for use as pesticides in Recommended Item 38.11:

208c - Dehydrated sulphate of copper for agricultural spraying purposes

Free	Free	Free

209b - Nicotine; salts of nicotine; non-alcoholic preparations containing nicotine in a free or combined state, for dipping, spraying or fumigating, n.o.p.

Free	Free	10 p.c.

- Non-alcoholic chemicals for disinfecting, or for preventing, destroying, repelling or mitigating fungi, weeds, insects, rodents, or other plant or animal pests, n.o.p.; non-alcoholic preparations compounded exclusively for disinfecting or for preventing, destroying, repelling or mitigating fungi, weeds, insects, rodents, or other plant or animal pests, n.o.p.:-

219a - (1) When in packages not exceeding three pounds each, gross weight

Free	$12\frac{1}{2}$ p.c.	25 p.c.

219a - (2) Otherwise

Free	Free	15 p.c.

219e - Chloropicrin, ethylene oxide, methyl bromide, methyl formate, cyanides, carbon bisulphide, acrylonitrile, or mixtures containing any of these, for use in combatting destructive insects and pests

Free	Free	Free

There are forty-one end-use items, and a further part of tariff item 203, the deletion of which is recommended by the Board.

Tariff Item 158a provides free entry for methyl alcohol for use in the manufacture of formaldehyde. In its Summary and Conclusions on Recommended Items 29.04(8) and 29.11(8) dealing respectively with methyl alcohol and formaldehyde, the Board, in recommending rates of 5 p.c. and 10 p.c. for each product, pointed out the close and, at times, conflicting relationship between them; because of the considerations giving rise to these rate recommendations, the Board also recommends deletion of tariff item 158a.

The beginning of existing tariff item 203 provides free entry for "non-edible ... plants, weeds, barks, and woods, ... and extracts and preparations thereof, ... when adapted for dyeing or tanning." In this part of the item, concentrated sulphite lye is now classified. The Board, in Recommended Item R-5 203, has recommended continuation of this first part of existing item 203, but without the words "and extracts and preparations thereof". This change involves a number of products now classified in the existing item. Many of these products are recommended elsewhere for continued free entry in other recommended items: in 29.16(16) gallic acid, in 32.01 the tanning extracts of vegetable origin, in 32.02(1) gall-nut tannin and in 32.04(1) colouring materials and dyeing extracts obtained from many of the products enumerated in the existing item such as copper chlorophyll, oenin, sodium chlorophyll, non-edible extracts of turmeric and imitation vandyke brown. Some other products are the subject of rate recommendations other than free entry: in 29.41(1) tannates and other tannin derivatives of glucosides at Free and 15 p.c., in 29.42(1) tannates and other tannin derivatives of vegetable alkaloids at Free and 15 p.c., in 32.04(2) extracts of turmeric for use as edible colouring at 10 p.c. under both Tariffs and in 38.06 concentrated sulphite lye, available from Canadian production, at rates of 10 p.c. and 15 p.c.

Tariff item 203a provides free entry for chemical compounds, composed of two or more acids or salts soluble in water, adapted for tanning or dyeing. For a number of products now entered under this item, the Board has elsewhere recommended free entry under both tariffs: for chromium potassium sulphate in 28.38(8), for basic chromium sulphate in 28.38(9), for prepared mordants in 38.12(3), for sodium dithionite in 28.36(2), for sodium formaldehyde sulphoxylate in 28.36(3), for the qualifying synthetic organic dyestuffs in 32.05(1), for the qualifying tanning substances in 32.03(1), for zinc dithionite in 28.36(4) and for zinc formaldehyde sulphoxylate in 28.36(5). Concentrated sulphite lye in Recommended item 38.06 and sodium formaldehyde naphthalene sulphonates in Recommended item 32.03(2), both available from Canadian production, would become dutiable at 10 p.c. and 15 p.c.

Tariff item 203d provides free entry under both tariffs for certain pigments, inks, and binders for both, when for use in the coating, colouring or printing of textiles. The conflict in relation to this item was one between the producer of pigments and the producer of coated, coloured or printed textiles; both are large industries, both receive protection under the Customs Tariff; aware of the conflict, the Board, in view of the other recommendations, could find no good reason for perpetuation of a special end-use provision; it has recommended the deletion of tariff item 203d and the products no longer

granted free entry for the specified end-use would become subject to the rates recommended in such Recommended Items as 28.47(1), 28.52(1), 32.05(4), 32.07(1), (3A), (7) and (8), 32.13 and 38.12(1).

Tariff item 203f provides free entry for coal tar bases or salts, with or without surface active agents, for use in the manufacture of coal tar dyes. In Volume 3 the Board has listed over 125 products known to be entered under tariff item 203f with indications for each, of its prospective classification in the Recommended schedule. In accordance with its attempt to reduce the number of end-use items, the Board has recommended deletion of end-use item 203f.

Tariff item 203g provides entry at 5 cts. per gallon -- an ad valorem equivalent, in 1965, of about 1.5 p.c. -- for solutions of dyes containing methyl alcohol for use exclusively in the colouring of coated surfaces. In Recommended Item 29.04(8) the Board has recommended a considerable reduction in duty on methyl alcohol; synthetic pigment dyestuffs are now produced in Canada. From discussion at the public hearing the Board concludes that it would be impracticable to distinguish between those pigment dyestuffs which are of a kind produced in Canada and those which are not. For these reasons and because of its attempt to reduce the number of end-use items applicable to chemicals the Board recommends deletion of item 203g; this recommendation would render most of the products classified in the item dutiable at 10 p.c. and 15 p.c. under Recommended Items 32.05(4) and 32.09(1).

Tariff item 207b provides free entry for ethylene glycol for use in the manufacture of explosives. Ethylene glycol, available from Canadian production, is discussed in the Summary and Conclusions to Recommended Item 29.04; under paragraph (5) of this Recommended Item, the product would bear rates of 10 p.c. under both tariffs without end-use qualification, instead of the existing rates of 10 p.c. and 20 p.c. In 1966, there were imports valued at $5,000 under tariff item 207b, all from M.F.N. countries. The Board recommends its deletion.

Tariff items 208y, 219d(1), part of 219d(2), 857, 863, 875a and 875b, with the exception of the part of 219d(2), provide free entry under both tariffs for products used as anaesthetics or for making medicaments or pharmaceuticals; apart from a general statement by the Canadian Pharmaceutical Manufacturers' Association that end-use items be retained for chemicals not produced in Canada when imported for the manufacture of drugs, these items were the subject of no detailed representations showing need to retain them; in line with its attempt to reduce the number of end-use items, the Board has recommended their deletion. Tariff item 219d(2), in part, provides rates of Free and 20 p.c. for preparations of vinyl ether for anaesthetic purposes; all imports in 1965 were from M.F.N. countries; these preparations would become subject to rates of 10 p.c. and 15 p.c. under Recommended Item 38.19(1). The goods enumerated in the other end-use items would be classified in a variety of Recommended Items.

Tariff item 215a provides free entry for stearic acid for use in the manufacture of candles or crayons. The crude stearic acid and mixtures or blends of stearic acid and other fatty acids not containing 90 per cent by weight of any one acid, would become subject to rates of 10 p.c. and 15 p.c. under Recommended Item 15.10(2) and the chemically defined stearic acid would become subject to rates of Free

and 15 p.c. under Recommended Item 29.14(1). Though little use appears to have been made of tariff item 215a there were imports valued at about $1,000 in 1966; the Board recommends its deletion.

An extract from item 216 and from item 711, both now renumbered 21600-2, provide free entry for chromium trioxide which would become subject to rates of 10 p.c. and 15 p.c. under Recommended Item 28.21(3), for dihydroxydiphenyl sulphone which would become subject to rates of Free and 15 p.c. under Recommended Item 29.31(1), for monobutyl phenylphenol sodium monosulphonate which would become subject to rates of Free and 15 p.c. under Recommended Item 29.07(1), for phenolsulphonic acid which would become subject to rates of 10 p.c. and 15 p.c. under Recommended Item 29.07(4) and for stannous sulphate which would become subject to rates of Free and 15 p.c. under Recommended Item 28.38(1), when these four products are imported for use exclusively in the manufacture of tin plate. In 1965, the value of imports under these end-use items was estimated at about $250,000 of which about two thirds came from B.P. countries; the chromium trioxide and the phenolsulphonic acid are available from Canadian production; no representations were made for continuation of these items. The Board recommends their deletion.

Tariff item 220e provides rates of Free and 5 p.c. for materials of a class or kind not made in Canada for use in the manufacture of additives for heating, lubricating and fuel oils. The Board dealt with the additives themselves in Recommended Item 38.14. One company sought the retention of end-use item 220e for preservation of secrecy in the formulation of certain additives; such secrecy makes it very difficult for competitors to contest the claim that the substance is of a kind produced or not produced in Canada. Representations were made by five other companies, one chemical producer and four oil producers, of which only one oil producer sought continuation of the item. The Board recommends its deletion.

Tariff item 241 provides free entry for litharge and mixtures and combinations of litharge with other materials containing not less than 50 per cent by weight of litharge, for use in the manufacture of battery plates. The Canadian consumption of litharge is in the neighbourhood of 15,000 tons of which over 9,000 tons is supplied by the captive plants of the battery manufacturers; of the commercial sales, about two thirds to three quarters are made to battery manufacturers; in the five years 1959-63, total imports averaged 830 tons annually: about 14 per cent of the commercial sales or about 6 per cent of the total battery use if all imports had actually been for this purpose; in 1963 imports for battery use were about one half of the total imports, thus representing only about 3 per cent of the battery use. The deletion of the item has been recommended by the Board.

Tariff item 246b provides rates of Free and 20 p.c. for stains and oxides valued at not less than 20 cents per pound for use exclusively as colouring constituents in the manufacture of vitreous enamels and pottery glazes. To bring the M.F.N. rate into conformity with its other recommendations and because of Canadian production of ceramic colours and glass colours, the Board recommends deletion of this item; in consequence there would be a broad application of rates of 10 p.c. and 15 p.c. under Recommended Item 32.08, though a few products unavailable from Canadian production would be entered at rates

of Free and 15 p.c. or less under Recommended Items such as R-37(1), 28.25, 28.28(1), 28.35(1), 28.50 and 28.52(1).

Tariff item 246c provides free entry for finely divided metals or compounds of metals whether dry, or suspended or dissolved in a liquid, for use exclusively in the manufacture of glassware and of tableware of china, porcelain or semi-porcelain. Because of Canadian production of many of the products mentioned in this item, the Board recommends its deletion; in consequence there would be a broad application of rates of 10 p.c. and 15 p.c. under Recommended Item 32.08, though a number of products unavailable from Canadian production would be entered at rates of Free and 15 p.c. or less under various other recommended items.

Tariff item 269b provides free entry under both tariffs for unsulphonated alkyl aryl hydrocarbons for use in the manufacture of synthetic detergents. The imports under this end-use item would be classified in Recommended Item 38.19(2) at rates of 5 p.c. and 10 p.c.; three companies proposed deletion of the end-use item and because of the considerations mentioned in the discussion of Recommended Item 38.19(2), the Board recommends deletion of end-use item 269b.

Tariff item 295c provides rates of 10 p.c. under both tariffs for activated clay when imported for use in the refining of oils; activated clay, available from Canadian production, is subject to a recommendation for rates of 10 p.c. and 15 p.c. in Recommended Item 38.03(2). There were no representations for continuation of end-use item 295c and the Board recommends its deletion.

Tariff item 488, in part, provides rates of Free and 10 p.c. for platinum and black oxide of copper, for use in the manufacture of chlorates and colours. Under the Board's Recommended Schedule, in the absence of this end-use item, the platinum would be entered free of duty under existing item *363 and the black oxide of copper would become subject to rates of Free and 15 p.c. under the following Recommended Items: natural copper oxides, R-37(3) and cupric oxide, 28.28(1). In 1965 the value of imports under this end-use item is estimated to have been less than $100,000, mostly from B.P. countries. In these circumstances the Board has recommended deletion of the end-use portion of item 488.

Tariff item 490a provides free entry for vanadium preparations for use as catalysts. Catalyst preparations are the subject of provisions in Recommended Item 38.19; in paragraph (5) provision is made for free entry for such preparations for cracking petroleum, other than the fluid-bed type which is available from Canadian production; for the fluid-bed type and other catalyst preparations, Recommended Item 38.19(1) would provide rates of 10 p.c. and 15 p.c. The petroleum industry is the main consumer of catalyst preparations. The Board has recommended deletion of tariff item 490a.

Tariff item 664(2) provides free entry for glycerine for use in the manufacture of explosives; a manufacturer of explosives expressed agreement to its deletion because glycerine is not normally used in such manufacture owing to the hazard involved. The Board recommends deletion of tariff item 664(2).

Tariff item 664a provides free entry for nitrate compounds not elsewhere specified adapted for use in the manufacture of explosives. A Canadian manufacturer of explosives proposed free entry for strontium nitrate only and deletion of tariff item 664a; for the reasons given in the Summary and Conclusions on Recommended Item 28.39, where the Board recommended free entry for strontium nitrate in 28.39(7), the Board recommends the deletion of end-use item 664a.

Tariff item 728 provides entry at Free and 10 p.c. for hyposulphite of soda for use in tanning leather. The imports under this item, in 1965, were negligible. The product, under the name sodium thiosulphate, is the subject of recommendations in Recommended Item 28.37: under paragraph (1) the anhydrous form would be entered at rates of Free and 15 p.c. and under paragraph 5 the product in the non-anhydrous form which is available from Canadian production, would be entered at rates of 10 p.c. and 15 p.c. The Board recommends deletion of tariff item 728.

Tariff item 729 provides free entry under both tariffs for sodium hexametaphosphate used in tanning leather. Sodium hexametaphosphate, which would become dutiable at rates of 10 p.c. and 15 p.c. under Recommended Item 28.40(3), is available from Canadian production and is now dutiable generally at rates of 15 p.c. and 20 p.c. under tariff item 711. End-use item 729 appears not to be the subject of imports. The Board recommends its deletion.

Tariff item 758 provides free entry for binitrotoluol, trinitrotoluol and perchlorate of ammonia for use in the manufacture of explosives. One Canadian producer of explosives urged repeal of this item. Both binitrotoluene and trinitrotoluene are available from Canadian production in sufficient quantity to supply the domestic market. The Board recommends deletion of tariff item 758.

Tariff item 805 provides free entry under both tariffs for materials to be used in cementing together glass sheets for use in the manufacture of safety or non-shatterable laminated glass. Two companies sought retention of the end-use item; polyvinyl butyral sheeting appears to be the only product entered under the item; in Recommended Item 39.02(g)(1) this product would enter free of duty without end-use qualification. In the circumstances the Board recommends deletion of tariff item 805.

Tariff item 865 provides free entry under both Tariffs for unsulphated higher fatty alcohols for use in the manufacture of synthetic detergents. The fatty alcohols of this end-use item would be largely classified in Recommended Item 15.10(3) with free entry. Consequently the Board recommends deletion of end-use item 865.

Of the end-use items relating to plastics, ten are set out below:

*216e - Cadmium oxide, pelargonic acid, triphenyl phosphite and octoic acid for use in the manufacture of stabilizers for vinyl synthetic resins

Free	Free	25 p.c.

654a - Pins or pegs of synthetic resin used as bristles in the manufacture of brushes

Free	5 p.c.	20 p.c.

833 - Methyl ethyl ketone imported by Canadian manufacturers under such regulations as the Minister may prescribe, for use exclusively as a solvent for polyvinyl chloride

Free	Free	25 p.c.

904a - Compounds, n.o.p., consisting in chief part of synthetic resins, for use in the manufacture of chewing gum

5 p.c.	5 p.c.	25 p.c.

921 - Materials of a kind not produced in Canada for use only in the manufacture of goods enumerated in tariff items 901, 902, 903, 904, 905, 906, 907, 909, 910, 911, 912, 913, 914, 916, 917, 918(a), 918(b), 919 and 925, but not including goods themselves enumerated in tariff items 901 to 920, inclusive

Free	Free	10 p.c.

922 - Phenol for use only in the manufacture of synthetic resin glues

Free	Free	10 p.c.

923 - Phthalic anhydride, adipic, abietic, maleic and succinic acids, hexamethylene diammonium adipate, hexamethylene diammonium sebacate, hexamethylene diamine, caprolactam, and ethylene glycol, when imported by manufacturers of synthetic resins, for use exclusively in the manufacture of synthetic resins, in their own factories

Free	Free	10 p.c.

924b - Cast phenolic resin handles, in the rough, for use in the manufacture of cutlery

7½ p.c.	7½ p.c.	30 p.c.

924c - Cellulose plastics plates or sheets, less than 6 inches in width, for use in the manufacture of spectacle and eye-glass frames

Free	Free	25 p.c.

925 - Phenol-aldehyde resins without admixture or in the form of aqueous emulsions, aqueous dispersions or aqueous solutions, without admixture, for use in the manufacture of plywood

Free	Free	17½ p.c.

In its Summary and Conclusions for both Recommended Items 39.01 and 39.02, published in Part I of this Volume 4, the Board mentioned the larger nature of the increases recommended in the Plastics Schedule than elsewhere; in its last paragraph on the subject, the Board pointed out that the increases may serve to make the duties on resins and their products conform more closely with the rates recommended for their raw materials. Because of the recommended rate increases the Board sees less need for the end-use provisions of benefit to the producers; because of the need for such increases, the Board seeks to avoid erosion of the recommended additional protection or of the protection recommended for other chemicals by continuation of the end-use provisions; also the Board has sought to eliminate end-use provisions when possible. For several products of tariff item 921, free entry without end-use qualification is recommended in the appropriate item and free entry is recommended for tin-based stabilizers for synthetic resins; this latter recommendation is discussed in the Summary and Conclusions on Recommended Item 38.19(12) in Volume 4, Part I, at page 269.

For fourteen end-use items, the Board is recommending continuation with some change or modification: 208g, 208u, Ex. 220a(i), Ex. 711, 263b, 263c, 296e, 326d, 326f, 326q, 347e, 663b, 791 and 822.

In its present form, tariff item 208g provides free entry under both tariffs for calcium molybdate, molybdenum oxide, vanadium oxide and tungsten oxide, whether in powder, in lumps, or formed into briquettes by the use of a binding material, when for use in the manufacture of steel. With the exception of the provision for molybdenum oxide which is available from Canadian production, the Board, in Recommended Item R-8 208g, has recommended continuation of the existing item; the molybdenum oxide and its preparations would become subject to rates of 10 p.c. and 15 p.c. under Recommended Item 28.28(3) or 38.19(1). Over and above the removal of this one product from the scope of this end-use item, the Board, in Recommended Item R-8 208g, has recommended the addition of four further products for use in the manufacture of steel: barium-cadmium complex, barium-silicon complex, calcium-magnesium complex and calcium-silicon complex. These four products, not produced in Canada, are now imported from the United States by a Canadian chemical producer for resale to the steel industry for use in the manufacture of specialty steels; the market is said to be small and the products are now dutiable at 15 p.c. and 20 p.c. under tariff item 220a(i) or 711.

Tariff item 208u now provides free entry for xanthates and sulpho-thio-phosphoric (dithio-phosphoric) compounds, for use in the process of concentrating ores, metals or minerals. Because of Canadian production of xanthates, mentioned in Recommended Item 29.31, the Board, in Recommended Item R-11 208u, has recommended continuation of the existing end-use item but without the provision for xanthates.

The extracts from tariff items 220a(i) and 711, now renumbered 22005-2, provide entry at 10 p.c. under both tariffs for hydrolized animal matter for use as a retarder for calcined gypsum. Recommended Item 38.19(8) would provide for continuation of present end-use rates without restricting the retarder use to calcined gypsum. The subject is more fully discussed in the Summary and Conclusions on Recommended Item 38.19 under the sub-heading: Hydrolized Protein Retarders.

Tariff item 263b now provides free entry, under both tariffs, for diethyl ketone, methyl normal propyl ketone and blends thereof, methyl ethyl ketone, furfural and methyl isobutyl ketone for use only in the refining of oils. Because of Canadian production of methyl ethyl ketone, which is the ethyl methyl ketone of Recommended Item 29.13(7), and of methyl isobutyl ketone, which would be classified in Recommended Item 29.13(12), the Board has recommended the deletion of these two products from the existing end-use items and continuation, in Recommended Item R-18 263b, of the item with respect to the remaining products which are of a kind not produced in Canada.

Tariff item 263c provides free entry for materials, of a kind not produced in Canada, for use only as catalysts in the refining of petroleum. The Board's recommendations in Recommended Item 38.19(1) and (5) would provide rates of 10 p.c. and 15 p.c. for catalyst preparations for cracking petroleum, of the fluid-bed type, which are produced in Canada, and free entry for the other types, which are not now produced in Canada. The subject is discussed at greater length under Recommended Item 38.19 in Part I of this volume. Any other goods covered by existing item 263c would be classified, upon the recommended deletion of tariff item 263c, in the appropriate Recommended Items.

Tariff item 296e now provides free entry under all Tariffs for magnesium oxide and magnesium carbonate, not further manufactured than ground, when imported by manufacturers of insulating materials for use exclusively in the manufacture of such insulating materials in their own factories. In Recommended Item R-21 296e, the Board has reproduced only part of existing item 296e with a recommendation for free entry for "magnesium oxide, or calcined magnesite, for use exclusively in the manufacture of electrical cables." These words would provide for most of the magnesium oxide now imported under existing item 296e, without change in rates of duty. The Board understands that the narrowing of the end-use provisions would have little if any effect, at present, on the amount of imports and that magnesium oxide of the type required for the end-use specified in the Recommended Item is not available from Canadian production. One effect of the Board's recommendation is of course to delete magnesium carbonate from the end-use item and to leave it subject to the Board's recommendation in Recommended Item 28.42; a further effect is to narrow the end-use from the manufacture of insulating materials to that of electrical cables and to broaden slightly the ancillary conditions. The only interested company sought no continuation of the provision for magnesium carbonate nor continuation of the broader provisions for "insulating materials."

Two of the fourteen end-use items provide free entry for beads, drops or other shapes for use in the manufacture of imitation pearls: 326d for those of glass or cellulose acetate and 326q for those of synthetic resins. It was made to appear to the Board that the goods entered under the two items were not produced in Canada and that imports are small. In Recommended Item R-22 326d the Board has recommended continuation of the provisions of both items in one place, with very minor modifications.

Tariff item 326f provides entry at Free and 15 p.c. for moulded illuminating shades, reflectors and refractors of glass, of synthetic resins, of pyroxylin, or of plastics of cellulose acetate or

other chemical derivatives of cellulose, of a class or kind not made in Canada, designed for use with lighting fixtures or with portable lamps. This item was referred to the Board in so far as it relates to chemicals or plastics. No representations were received relating to it. In Recommended Item R-23 326f, the Board has recommended continuation of the provisions of the existing item which are outside the scope of the Reference. It has recommended deletion of that part of the item covering goods of synthetic resins, of pyroxylin, or of plastics of cellulose acetate or other chemical derivatives of cellulose which would become subject to rates of 20 p.c. under both tariffs in Recommended Item 39.07.

Tariff item 347e provides for entry at Free and 5 p.c. for electrolytic manganese metal for alloying purposes; the product is not made in Canada and duty-free entry was proposed until it became so made. Imports are mostly from M.F.N. countries. The electrolytic manganese metal was said not to be a chemical; nevertheless the product was referred to the Board. In Recommended Item R-36(4) the Board is recommending continuation of the item with free entry under both Tariffs.

Tariff item 663b provides free entry under all tariffs for articles which enter into the cost of the manufacture of fertilizers when imported for use exclusively in the manufacture of fertilizers. In 1965, the value of imports under existing item 663b, was estimated at $40 million, principally from most-favoured-nation countries. In its Summary and Conclusions relating to Recommended Item 31.00, published in Part I of this volume, the Board discussed the subject of fertilizers; because of the considerations mentioned there the Board has recommended the continuation of end-use item 663b in Recommended Item R-31; the recommendation involves an amendment by substituting for the initial word "articles", the word "goods" thus broadening the scope slightly to conform to the free trade atmosphere surrounding customary low tariff on fertilizers throughout most of the world and to avoid possible conflict or dispute.

Tariff item 791 provides for free entry for materials of all kinds for use in producing or manufacturing certain pesticidal preparations provided for in tariff item 209b and 219a. In 1965, the value of imports under existing item 791, was estimated at about $7 million, of which some 85 per cent was from most-favoured-nation countries. In its Summary and Conclusions relating to Recommended Item 38.11, published in Part I of this volume, the Board discussed the subject of pesticides; because of the considerations mentioned there, the Board has recommended continuation of end-use item 791 in Recommended Item R-35; the recommendation involves an amendment by substituting, for the two tariff items now mentioned in the end-use item, Recommended Item 38.11 thus broadening the scope of the Recommended end-use item to include a somewhat greater number of pesticides.

Tariff item 822 provides free entry for sheet cellulose acetate, in rolls, when imported by manufacturers of sensitized photographic film, for use exclusively in the manufacture of sensitized photographic film in their own factories. Cellulose acetate photographic base film is not produced in Canada; in 1965 the value of imports was estimated to be in excess of $1 million. In these circumstances the Board has provided for continuation of this end-use provision in sub-paragraph 1 of paragraph (g) of Recommended Item 39.03; the end-use free entry in sub-paragraph one results from the end-use exclusion in the following sub-paragraph 2. For cellulose

acetate butyrate film, a similar end-use provision is made in Recommended Item 39.03(g)3, discussed towards the end of this section.

For nine end-use items the Board is recommending continuation without change; they are tariff items *206 in part, 208e, 208x, 220f, 246d, 262, 270, 316b and 851.

Tariff item *206, in the last goods enumerated, provides free entry for ferment cultures to be used in butter-making. Deeming this portion of the item, together with certain other portions thereof, to be beyond the scope of the Reference, the Board has recommended their continuation, without change, in Recommended Item R-6 *206.

The cresylic acid and its compounds of tariff item 208e, used in the process of concentrating ores, metals or minerals, n.o.p., are entered at rates of Free and 15 p.c. The mining interests sought retention of this item; a Canadian company produces cresylic acid which is used for purposes other than those set out in the end-use item; the producer, not interested in supplying mines over long distances, raised no strong objection to the end-use item. The Board has recommended continuation of end-use item 208e.

Tariff item 208x provides free entry under all Tariffs for materials and parts, entering into the cost of cyanide of calcium, cyanide of potassium and cyanide of sodium, for use in the manufacture of cyanide of calcium, cyanide of potassium and cyanide of sodium. For the three cyanides the Board has recommended free entry in Recommended Item 28.43 in paragraphs (2), (3) and (4); they are now subject to free entry under tariff item 208 and were the subject of proposals for continued free entry. Calcium cyanide and sodium cyanide, both produced in Canada are exported to the U.S.A. where they are subject to free entry. The Board recommends continuation of end-use item 208x.

Tariff item 220f provides for askarels (non-flammable liquids) for use in the manufacture of electrical apparatus at rates of Free and 5 p.c. The askarels are not available from Canadian production; two Canadian companies engaged in the manufacture of electrical apparatus urged the continuation of the end-use items to avoid cost increases to them. The Industry Committee proposed free entry until the commencement of Canadian production. In 1965 all imports were from M.F.N. countries. The Board recommends continuation of end-use item 220f.

Tariff item 246d provides free entry for colours or pigments for use in the manufacture of roofing granules; the granules are subject to free entry under tariff item *309a. The largest Canadian manufacturer of roofing granules sought retention of the end-use item because consumers in more distant areas could import more economically than they could purchase from domestic production with added freight charges. The company represented its policy to be to buy in Canada whenever possible. The Board recommends continuation of end-use item 246d.

Tariff item 262 provides free entry under both Tariffs for chemical compounds for removing water and salts from crude petroleum oils. Three of the oil companies sought retention of this end-use item and there was no opposition to the request. In 1965 practically all imports were from M.F.N. countries. The Board recommends continuation of end-use item 262.

Tariff item 270 provides free entry under all Tariffs for oil for use in the concentration of ores. The mining interests naturally urged its continuation. One chemical producer believed that there might be some interchangeability in use between frothers produced by it and the oils of tariff item 270; this company and three others urged the exclusion of products of a "class or kind" made in Canada. Most imports, in 1965, were from M.F.N. countries. Because of the importance of this item to the mining industry and because there was no clear evidence of harm to the chemical-producing industry the Board recommends continuation of Recommended Item 270.

Tariff item 316b provides for free entry under all tariffs for metallic elements and tungstic acid when imported by manufacturers for use only in their own factories in the manufacture of metal filaments for electric lamps. The item was referred to the Board insofar as it refers to chemicals and it encompasses tungstic acid; the only representations made to the Board urged continuation of this end-use item. In 1965 imports, estimated at about $2 million, were almost all from M.F.N. countries. The Board recommends continuation of end-use item 316b.

Tariff item 851 provides for free entry under all Tariffs for materials for use in the manufacture of synthetic rubber. Polymer Corporation Limited urged the continuation of this item: Polymer produces almost all of the synthetic rubber produced in Canada and exports some 70 per cent of its production; the corporation's brief pointed out the similarity of circumstance in synthetic rubber and fertilizers: long-standing end-use free entry for materials, exportation of a major portion of domestic output and similar free entry or low rates on end products. The end-use provision was first established in 1943 and many Canadian manufacturers have entered into production or enlarged existing productive facilities in full awareness that their products could be imported free of duty under tariff item 851. Polymer represented that export drawback provisions, even with the exportation of 70 per cent of its production, would not meet its needs because it must preserve the domestic market -- 20 per cent of which is served by imports -- to keep up its volume of production and keep down its costs. Furthermore, in the major rubber markets of the world, synthetic rubber is either free of duty or subject to low rates. In 1961, Polymer imported, under tariff item 851, materials valued at about $10 million, or one third of the cost of materials used in making synthetic rubber; in 1965, imports under the item were estimated at $11 million, almost all from M.F.N. countries. There is indeed a parity of circumstance between synthetic rubber and fertilizers: a broad area of low rates of duty or free trade throughout much of the world. Because of the importance of the item to the synthetic rubber industry in its particular circumstances, the Board recommends the continuation of end-use item 851.

Over and above the existing 113 end-use items mentioned in the preceding pages, the Board has recommended new end-use provisions, or new provisions related to end-use, in six recommended items: R-3 156(7)(a), R-40, 29.01(8), 29.38(4), 31.00(1) and 39.03(g)3.

In Recommended Item 31.00(1) provision is made for "goods for use as fertilizers." A discussion of this subject appears in the Summary and Conclusions on Recommended Item 31.00 in Volume 4, Part I,

at pages 208 to 216. This end-use provision would have substantially the same effect as the existing administration of tariff items such as 662 and 663; in addition it would remove the present M.F.N. rate of 5 p.c. on compounded or manufactured fertilizers.

In the other five additional end-use items, the end-use form of enumeration is intended to distinguish more clearly between chemicals, in conformity either with the Minister's letter of reference, or with the Brussels Nomenclature or with availability from Canadian production, rather than to discriminate between end-uses.

In the first letter of reference, published on pages 10 and 11 of Volume 1, the Minister of Finance stated his intention that the Board include in its study tariff item 156(f) with reference to ethyl alcohol. Because of the wording of tariff item 156(f) -- later renumbered 156(6) and now renumbered 15630-1 -- it is clear that spirituous or alcoholic liquors and beverages were not within the scope of the Reference. In Volume 4, Part I, the Board has set out its Summary and Conclusions on Recommended Item R-3 156(7) on pages 11 to 15. To ensure that undenatured ethyl alcohol for use as a spirituous or alcoholic beverage, or for the manufacture of such beverages, would remain subject to the existing rates of duty, the Board chose the method of end-use to distinguish such ethyl alcohol in Recommended Item R-3 156(7)(a) from the "ethyl alcohol, n.o.p." of Recommended Item R-3 156(7)(c).

Recommended Item R-40 provides for hexamethylenetetramine and metaldehyde put up in tablets, sticks or similar forms for use as fuel; the provision is designed to enumerate forms of the two products excluded by the Brussels Nomenclature from Recommended Item 29.26(3) for hexamethylenetetramine and from Recommended Item 29.11(1) for metaldehyde; the rates recommended are the same as the two products would bear were they not so excluded.

Three of the recommended items are couched in terms of end-use primarily to distinguish forms of a product currently available from Canadian production from other forms not so available: the cyclopropane for anaesthetic purposes of Recommended Item 29.01(8), the Vitamin A and its derivatives for uses other than the production of food products for human consumption of Recommended Item 29.38(4)(b) and, finally, the cellulose acetate butyrate film, other than unsensitized film for use in the manufacture of sensitized photographic film, of Recommended Item 39.03(g)3.

On the foregoing six additional end-use provisions, more information will be found in the Summaries and Conclusions on the appropriate recommended items; these are published in Volume 4, Part I.

A number of other new end-use items were proposed at various times during the hearings but were not recommended by the Board. The Board envisages, however, that some increase in end-use provisions might prove to be necessary in special circumstances. The possible use of temporary free-entry provisions is noted on page 16 of Volume 1 of this Report.

Many proposals for new end-use items are discussed at appropriate places in other volumes of the Report; a summary note on some of the proposals is contained in that part of Volume 15 dealing with "Other Portions of Reference 120."

RATES - GENERAL REPRESENTATIONS

As is usual in references to the Board, many conflicting representations were made to the Board on the subject of the rates of customs duty which should be applicable either to specific products or more generally to the products of the chemical industry.

The representations narrower in scope, based on special circumstances or directed to only one or a few products, are the subject of discussion in the appropriate Recommended Item in the Board's Summary and Conclusions published in Part I of this Volume 4.

However, in this portion of Part II of Volume 4, the Board is setting out some of the more general and frequently repeated representations made to it on the subject of rates.

Many considerations of a general nature were raised repeatedly by the industry, though with somewhat different emphasis as different products or different groups of products were reviewed. Repeated reference to them in the context of each product or group would be tedious and repetitious; indeed such a method would serve only to lengthen a Report which, for other, and more valid reasons, is inevitably of great length. Consequently, to the extent possible, the Board has sought to deal with these general considerations in one place.

Some of these general considerations were represented as being, wholly or in part, consequent upon the size of the Canadian market for chemicals. One such circumstance frequently called to the attention of the Board was the smallness of the operations of many of the chemical establishments in Canada as compared with similar operations in other countries. As a result of this circumstance, it was suggested, the costs of Canadian chemical producers tend to be higher than those of their competitors abroad. It was further urged that these higher costs made necessary higher rates of duty than would otherwise be required; it was frequently represented that such duties should be made applicable to nearly all chemicals and, for the most part, at uniform rates of 15 p.c., B.P., and 20 p.c., M.F.N.

When appropriately qualified, the proposition that an increase in the size of operations may make possible cost-reducing economies is true in the production of chemicals, as indeed it is in other industries. Within some range of outputs, in most types of operations, given that other conditions are similar, unit costs may often be lowered by the use of a plant efficiently designed to produce a larger output and efficiently operated to produce approximately that output.

Even when the larger capacity is obtained by mere duplication of existing equipment it may be possible in a larger operation to obtain a lower unit cost by using the various kinds of input, such as equipment and operating staff, in more satisfactory proportions.

The production of chlorine was also used as an illustration of the advantages of size in the utilization of wastes or the recovery of by-products. In large chlor-alkali plants it is economical to convert the by-product hydrogen into ammonia, whereas in smaller plants the hydrogen is released to the air or burned as an addition to fuel or as a waste.

In the chemical industries, the range of output within which differences in the scale of operation may have an important effect on unit costs varies greatly from plant to plant and from process to process. In some operations the potential economies of size would increase as the capacity of the plant was extended far beyond the size of the Canadian market or indeed of any existing market. In others, however, all or most of the economies of size can be secured by an establishment designed to produce only a fraction of what can be sold in the market.

Not only are there limits to the economies of size but as larger operations are undertaken, offsetting diseconomies not infrequently appear; it may be more difficult or more expensive to maintain efficiency in the larger operation; greater care and expense may be required to avoid traffic congestion in the receipt of materials or the shipping of products or in the routing of products and materials within the plant. Some of the economies of large operations in some plants of the chemical industry are obtained only by the sacrifice of flexibility; for example, some of these economies may depend on continuous large-volume operation and the use of a very uniform raw material; the cost of adjusting the process to a somewhat different raw material and of changing the rate of output or of stopping and starting the process may be prohibitive. If the market for the product is variable, seasonally or otherwise, the rigidity of the large plant may make it necessary to incur the additional cost of providing storage facilities to offset the built-in rigidities of the large plant. It is unnecessary to exemplify further the many kinds of diseconomies which may result as the size of the operation is increased. These serve to reduce the net economies of large scale production in many branches of the industry and to limit the optimum size of plant.

In addition to the production economies of large-scale operations there may be buying or selling economies. In the chemical industries a lower price is often quoted on large bulk shipments than on smaller lots. An increase in the size of operations may make it possible to buy in large quantities at the lower price. However, in some branches of the industry this advantage may be offset, at least in part, by the greater flexibility of the smaller operator, who, if alert, may obtain a significant proportion of his raw materials at prices which reflect the failure of the product to conform exactly with the specifications of some other buyer but which he can use because of the flexibility of his operation. In some cases, for example in the large purchases of polyethylene resins, the larger Canadian producers contended that this was an unfair advantage and urged that tariff measures be adopted to prevent or discourage the small producer from purchasing foreign-produced, off-grade resin at bargain prices.

Given the capacity of the plant, of course, the unit cost tends to be higher when the plant is not fully utilized. This is not to deny, however, that within some range of outputs, unit costs may be lower in a large plant producing at somewhat less than capacity than in a smaller plant designed to produce the required output.

The importance of the economies made possible by mere size vary enormously from one chemical or group of chemicals to another. In all, however, these economies can be fully attained only by efficient operation. Quite apart from size, efficiency of operation affects

costs; in many cases it is more important, and in some much more important, than size.

Moreover some costs which are important in the chemical industries such as the cost of fuel, power or materials may differ considerably between plants without reference to their size. For example, a sulphur dioxide plant at Copper Cliff, Ontario, makes use of waste gases which not only otherwise would have no value to the smelters but, in fact, represent a decidedly undesirable waste material; this advantage in obtaining raw material enables the plant to produce sulphur dioxide at prices much below those which prevail in the United States even though the waste gases are available only in quantities which limit the size of the sulphur dioxide plant.

It is not to be expected, then, that the relationship between unit costs and size of operation will be uniform and consistent, bearing in mind the impact which other factors may have. This is illustrated by one product for which confidential data were given to the Board. The data show that United States plants produce on a much larger scale than do the Canadian plants and that costs of production of this product are lower in the United States than in Canada. However, closer analysis of these data shows that lower costs did not regularly accompany larger scale of production. For example, two plants in the United States, with half or less than half the output of a third plant had costs in the vicinity of 10 per cent lower than the much larger plant. The same data also revealed one Canadian plant with an output of 34 per cent and 20 per cent larger respectively than two smaller ones with costs 23 per cent and 16 per cent higher respectively than the two smaller plants.

The concern over economies of scale has sometimes led to the design and construction of plants with capacities larger than has appeared wise in immediate retrospect; in the result, such economies as might result from mere scale have been lost because of some other factor such as insufficient utilization of capacity. This unfortunate circumstance may, at times, arise from the tendency of companies affiliated with large United States firms to attempt to reproduce the experience in the United States by the use of similar equipment perhaps merely scaled down but not designed afresh. There have been other cases where fresh Canadian design has brought into being smaller and more versatile plants with greater economy.

Notwithstanding the repeated submissions about capacity and utilization, there was frequent evidence of cost increases arising from the establishment of multiple productive facilities for the same product, each of less than optimum size or only partially utilized. Some of the multiplicity is sound: for example, that dictated by the economics of geography and transportation costs. Another part of the multiplicity is less sound where several productive establishments situated in the same area seek to sell their output to a local market incapable of supporting them all.

Whatever the effect of multiple sources of production may be, it is not axiomatic that any additional costs should be the subject of equivalent tariff protection; to accept such a principle would require the consumer to meet the full cost of excess capacity whatever might be the circumstances of the case. The consumer may perhaps benefit

from such overcapacity, particularly if it is of a temporary nature: it may stimulate the introduction of competition, of more economic procedures or of improvement in marketing practices. However this is not always the case: sometimes excess capacity resulting from mere error of judgment or from the battle tactics of corporate warfare may increase the costs of producers without benefit to the consumer.

In summary, scale of production is only one of the circumstances that may affect the unit costs of different producers of a chemical. Within some ranges of output and for some products it is one of the very important circumstances; in other ranges and for other products it may be much less important than the differences in the other circumstances that affect unit costs. It is apparent that it provides no certain argument for the application of high and uniform rates of duty.

The Board was repeatedly told that the criterion of cost, always difficult to apply, is particularly difficult to apply in the chemical industry, primarily because of the complexity of the operations and the interdependence of products in production and consumption.

In any event the public should not be called upon to support, by the Customs Tariff, the costs of a multiplicity of plants each too small to secure the economies available to larger plants nor to guarantee the profitability of a plant prematurely established when the market for its products is unreasonably small.

There were occasionally representations to the effect that Canada would benefit by applying prohibitive rates of duty to goods the production of which had resulted in a higher value added per unit of labour than in some other industries. It was urged that such "productive" employment, when extended by tariff encouragement, would increase the Canadian per capita real income. In some instances this use of protection was urged for goods for which access to the market was currently restricted by patents nearing their date of expiration. However it would appear that the higher value added per unit of labour is dependent at least in part on the patentee's ability, by means of patent or protection, to enhance prices, an advantage gained by the producer at the expense of the user, presumably a domestic user.

Accordingly the Board has not accepted the view that a relatively high value added per unit of labour necessarily represents a reason for a high level of protection, especially where the high value added reflects higher prices than might be expected to prevail in the absence of patents or rates of duty.

Throughout the Reference there was often a sharp divergence of view between the producer and the consumer concerning the effect of higher rates of duty.

The producer, in his plea for tariffs, often argued that by his acquisition of a larger share, or of the totality, of the domestic market his costs, and thus his prices, could be reduced and that consequently advantage of the full tariff rate would not necessarily be taken in establishing domestic prices.

The consumer, with a caution that can hardly be deemed excessive, was generally more than reluctant to give support to this view. Indeed he was distinctly apprehensive that domestic prices would generally reflect, in some degree at least, the addition of the customs duty to the cost of imports. As a result many users of chemicals opposed higher rates on the ground of consequential increases in their own costs for materials. In some cases the consumers of chemicals were prepared to acquiesce in higher rates on the products of their material suppliers if compensating increases in rates were applied to their own products; the effect of such acquiescence, if the original apprehension is founded, is, of course, merely to pass on the increase, somewhat compounded, to the ultimate consumer and, presumably, to hinder the expansion of the market for the product.

The ultimate consumer was seldom heard at the public hearings; his interests are rarely the subject of well-documented briefs which can usually be prepared only at some expense. However, the Board is aware both of his needs and of the difficulty he has in making them known; in consequence the Board endeavours to weigh his needs in the scale.

It is far from clear that the producer's argument is easily acceptable without some qualification. At times, customs duties may serve only to create or perpetuate monopoly with its attendant perils; in most cases they serve to increase the cost of domestic or imported raw materials, a cost frequently stressed by the producers. In some instances they may serve only to permit price increases in domestic production which may even tend to restrict the physical volume of sales. In a good many cases they may serve only to increase prices to certain consumers whose needs will not be met by Canadian producers because of considerations such as geography or product grades. In some cases other factors such as transportation costs or efficient production ensure the entire domestic market or a large share of it to the domestic producer even without tariff protection. In certain other cases, where the domestic producer already has a very large share of the domestic market, the small increment remaining will not usually lower his production costs significantly. Even where the acquisition of a larger share of the domestic market would effectively lower costs it is not axiomatic that all or part of the saving will be reflected in proportionately lower prices to the consumer.

Reference was made to practices or procedures which allow certain chemicals to be entered at lower values for duty than the industry considered proper. These matters were placed before the Board in a way which tended to suggest that higher rates were required than might otherwise be necessary. Knowledge of such circumstances is useful to the Board as an aid to understand more clearly the general conditions of the industry. However, if a remedy is required, the remedy is not the application of higher rates of duty but rather the correction of a procedure or practice represented to be incorrect.

Throughout the hearings the attention of the Board was often drawn to the fact that the duty on materials used in the production of goods for export could be recovered by way of drawback.

However, it was often said before the Board that, for the individual taxpayer, the drawback procedure had the disadvantage of

immobilizing the sum of money involved from the time of payment to the time of reimbursement; there is also the administrative cost to the user of keeping the necessary special records; further it was represented that, for the administration, in the case of the 99 per cent drawback, the 1 per cent remaining in the Department's hands after reimbursement, failed to meet the Department's administrative costs in the transaction.

Drawback applied to exported goods, subject to the problems mentioned in the preceding paragraph, has the advantage of diminishing the effect of a customs duty on the taxpayer. However, it is without effect if the taxpayer acquires domestically-produced materials; it is also without effect on that portion of his production which is sold in Canada rather than exported.

Furthermore, when long runs are more economical than short runs, it may be less costly to use identical materials and production processes for both the domestic and the foreign markets; slight differences in materials may necessitate differences in processes and in consequence, shorter runs. This consideration may lead the producer, in some cases, to choose the domestic material even when it is higher in price, not only in producing for the domestic market but also in producing for the export market; in other cases it may also lead him to choose an imported material on which he must pay duty even though the domestic price has not been increased by the full amount of the duty.

In some instances, a commodity is produced for the market by a great many producers and some part of the resulting product is exported. It may then be impossible to ascertain or impracticable to record how much imported chemical has been used in the production of the exports or by whom it was imported.

In consequence it was represented that, because of the absence of benefit in many cases, drawback often failed to reduce production costs as much as might appear.

Though some of the foregoing aspects of drawback apply only to exported goods, others apply to drawback for home consumption as well: such are the cost of immobilizing capital, the administrative cost and the choice of materials for compelling reasons unrelated to tariff considerations.

It is therefore apparent that though drawback benefits may be very real in some cases, they may be illusory or partly illusory in others. The benefits can only be assessed with accuracy in the light of all the facts and circumstances. The Board has not therefore accepted as a governing principle that drawback for export or for home consumption necessarily represents a relief from the burden of customs duties measurable directly as the percentage of drawback established in any given case.

In its recommendations the Board is revising the nomenclature of the Tariff on chemicals very extensively. Such a revision necessarily involves certain adjustments in margins of preference; these necessary adjustments were specifically foreseen in the Minister's first letter of reference.

In relation to a number of products the Board recommended changes in margins of preference where it deemed them clearly to be the proper course. In other cases the Board recommended maintenance of the margins of preference for the same reasons. For a still further group the Board had to consider the case of products not made in Canada and not now imported from countries entitled to the British Preferential Tariff where free entry under both Tariffs might initially have appeared to be appropriate.

There were many proposals for free entry of products not now produced in Canada but dutiable at 15 p.c. under the Most-Favoured-Nation Tariff, though free of duty under the British Preferential Tariff. In such cases the maintenance of the margin of preference appears to compel purchasers from most-favoured-nation sources to pay duties in cases where neither Canadian production nor British preferential sources would benefit by the existence of a duty in the Most-Favoured-Nation Tariff. Against this consideration the Board has weighed the plea that though there may be no British preferential source today, one could come into being in the near future; it has also kept in mind the intricate interrelationship of the numerous preferences mutually accorded between Commonwealth members both in relation to the Tariff broadly and in relation to the Tariff on chemicals.

The general proposal of rates of 15 p.c. and 20 p.c. was the leit-motiv associated with the chemical industry throughout the inquiry. As exceptions to the general rule of 15 p.c. and 20 p.c., higher or lower rates were sought for various products but almost invariably stress was laid upon the exceptional nature of such proposals.

Many reasons for acceptance of the 15 p.c. and 20 p.c. proposal were urged before the Board.

It was argued that, with the overwhelming number of products to be considered, it would be impossible to review each one exhaustively and that a general rule with exceptions was the only practical solution. When the Board, at the hearings, inquired about the adoption of a general rule of free entry with exceptions at higher rates it was urged that, within the provisions of existing Customs legislation, rates may be more readily reduced than increased.

It was also urged that the chemical industry must - more than other industries - be viewed as an integrated entirety and not considered in small sections or product by product. Many chemicals are by-products or co-products of another, the production of certain chemicals is undertaken because of the availability of another which would otherwise bring no gain and the multiple interdependence is such that the economics of an enterprise can only be usefully considered in its entirety. This aspect of the industry was stressed repeatedly throughout the hearings.

The Industry Committee pointed out that several hundred thousand chemicals are known to science of which approximately 15,000 are of any substantial importance.

In its advocacy of a broad application of rates of 15 p.c. and 20 p.c. the industry urged repeatedly the special perils arising out of the constant rapid change in the chemical industry. It was

often argued that, though a given product might need little or no protection at the moment, changes could readily necessitate rates of 15 p.c. and 20 p.c. overnight; the principle advocated was one of a reasonably substantial rate to provide a "cushion" against unexpected adverse technological or economic changes.

This argument was frequently urged in the context of plant expansion abroad; such expansion in large increments and by several producers was pointed out as a source of overcapacity with consequent excessive reductions in price. On this score the fearful eye of domestic industry cast apprehensive glances, particularly at the United States of America, at Europe and at Japan.

Perhaps because increments in its productive facilities must often be large the chemical industry does appear to be more subject to temporary periods of overcapacity and undercapacity than many of the industries more readily capable of gradual adjustment by means of smaller capital expenditures. However, this characteristic is in no way restricted to the foreign chemical industry; there was nothing to show that in Canada chemical productive capacity tends consistently to be more reasonably related to markets than it is elsewhere. Canadian producers - and their foreign competitors - seem fated to exposure to the inevitable marked fluctuations in productive capacity of a highly capitalized industry.

Temporary overcapacity is by no means the only peril to which our chemical industry is exposed. This is an industry in which rapid changes in technology can bring lightning changes in the market place. These technological changes can substitute a new product for one well established in the market, they can bring about a change in the qualities or properties that are required and they can bring about serious price changes.

Because of these factors the industry pleaded for that margin of protection described earlier as a "cushion" against these perils. It urged that, if Canadian rates were lower than those prevailing in many countries, surpluses attributable to overcapacity abroad were likely to be directed towards Canada in unreasonably large proportions.

The Board is conscious of the reality of the peril against which the industry seeks to protect itself. However, as for any factor in tariff making, it would be very hazardous for the Board to consider this factor in isolation; it must be considered in the broad context of the overall problem and in the particular circumstances of any given case.

The industry naturally never argued before the Board that it should be protected from failure to advance with the times. Yet there is the difficulty that high rates of duty for the purposes suggested by the industry might well foster inefficiency by prolonging the use of older and more costly methods. A general reduction in rates of duty throughout the world, on the other hand, if this were possible, might tend to diminish the impact of shortage, excess capacity or technological change without impairing the incentive to develop and adopt an improved technology. Without losing sight of the impact of these conflicting factors, the Board has sought to weigh them one against the other as it made its recommendations.

The producers of many of the chemicals did not make representations that, currently, they needed higher rates of duty nor indeed rates as high as the existing rates in order to continue to operate. Rather, they pointed out that the existing rates on the chemicals in which they were interested were not higher than rates quite generally applicable to other types of manufactured goods. Many urged that the present rates should in general be maintained because they were not higher than necessary to give the chemical producers equitable treatment as compared with many other manufacturing industries and because, in the future, these rates would act as a cushion against unforeseen price reductions in other countries.

Some producers of chemicals, especially those who were dependent on the export market by reason of size or location of plant, urged that rates on the products they produced be not increased lest other countries should be induced to increase theirs in retaliation. Several, even of those who expressed no fear of retaliation, believed that for them a reduction of foreign rates of duty could be much more advantageous than the increase or the maintenance of existing Canadian rates of duty.

RECOMMENDED STRUCTURE OF RATES

In arriving at its recommended rates, the Board has considered the various representations, as well as the relevant factual information available concerning each product that came to its attention. Clearly the facts vary from product to product and the importance of any one circumstance for a particular product may vary according to the other circumstances relating to it. The factual information is set forth in detail in the products reports published in Volume 5 and subsequent volumes and, in more summary form, in the Summary and Conclusions relating to each of the Recommended Items in Part I of Volume 4.

In spite of the large number of chemicals and of the many differences in the circumstances that affect them, there are certain large groups with enough in common to make possible the general comments which follow; these comments may serve to make clearer some of the more general considerations that influenced the Board in making its recommendations; in addition they may clarify the general outline of the recommended rate structure.

For many chemicals of a kind produced in Canada, the existing items provide rates of 15 p.c., B.P., and 20 p.c., M.F.N., when they are imported for general use; there are also provisions, by means of a large number of end-use items for the entry, free or at lower rates of duty, of many chemicals when imported for use in certain types of Canadian production.

Generally the producers of chemicals recommended that all or most of the end-use items be deleted from the Customs Tariff, that the rates of 15 p.c., B.P., and 20 p.c., M.F.N., be retained on most chemicals to which they now apply, and that these rates be applied broadly to a wide range of named and unnamed chemicals now subject to lower rates; in addition, a few producers urged the application of even higher rates on certain products of interest to them.

Most of the chemicals within the scope of this Reference are used as materials in Canadian production. In many parts of the Canadian Tariff, and in the Tariffs of most other countries as well, lower rates are levied on materials used by productive enterprises than on the finished consumer goods which they are used to produce. In contrast, the rates of 15 p.c., B.P., and 20 p.c., M.F.N., are as high as those on many of the finished goods enumerated in the Customs Tariff, and higher than those on some. The use of chemicals in Canada is expanding rapidly and the Board is reluctant to recommend incorporation into the structure of Canadian costs a large and expanding area in which the costs of important materials might be higher - by as much as 15 p.c. and 20 p.c. - than those of producers abroad that use the same kind of materials.

Quite apart from the general rate proposals of the chemical producers, the existing Customs Tariff provides for the transfer of chemicals not elsewhere specified, when they are ruled to be of a kind produced in Canada, from tariff items such as 208t and 216 to tariff item 711, which bears higher rates; the automatic application of this provision tends to increase both the level and the extent of protection as the chemical industry becomes more fully developed.

The extension or continuation of protection arising from the proposals of the producers and from the existing provisions relating to chemicals of a kind produced in Canada would be contrary to the international trend toward the reductions in rates of duty both within and between trading areas. Consequently, the Board has avoided recommendations tending to maintain or rapidly to enlarge the area protected by the relatively high rates of the producers' proposals because it appears that such rates might well have to be reduced in the future in the interests of the country as a whole, even at the cost of considerable readjustment in a tariff-expanded chemical industry. To avoid the automatic application of higher rates, whether or not necessary, as more and more chemicals come to be produced in Canada, the Board is recommending the deletion in the items referred to it of those provisions which require the application of higher rates of duty when a chemical is ruled to be of a kind produced in Canada and is not recommending such provisions in its Recommended Items.

In making its recommendations for rates on products of a kind produced in Canada, the Board took into consideration several additional circumstances: that, in the past, the production of many chemicals has been begun and successfully continued even when not protected by rates of duty as high as 20 p.c.; that many producers of the chemicals which have been subject to that rate have not needed to take full advantage of it in pricing their products; that in some cases, such rates have contributed to encourage or allow increases in costs as a result of uneconomic duplication, within the same market area, of plants of less than optimum size or in unfavourable circumstances; that many chemicals are, nevertheless, produced in Canada only by one company or by a few companies thus limiting the Canadian users, in such cases, to one or a few alternative Canadian sources of supply; that, in some types of chemicals, the users have expressed apprehension that they would be powerless to protect their enterprises against price increases or against a disastrous narrowing of their profit margins - especially in those cases where the producer of their material is also a competitor in the market for their finished product; finally, that in parts of Canada far removed from a Canadian source of supply and where the local market is small, high rates of duty on chemicals may hinder the local development of other industries without benefiting the Canadian producers of chemicals.

For a large group of chemicals ruled to be of a kind produced in Canada and consequently subject to rates of 15 p.c., B.P. and 20 p.c., M.F.N., the Board has recommended rates of 10 p.c., B.P., and 15 p.c., M.F.N. The Board also has recommended these rates for a number of products not actually ruled to be of a kind made in Canada but which are, in fact, so made. Similarly, the Board has recommended these rates for some other products which appear about to be produced in this country, as well as for some products which are important competitors of products made in Canada. On many chemicals, these rates are lower than the existing rates when imported for general use, but higher than those provided for most of the end-use items that the Board has recommended for deletion.

A second large group of chemicals consists of those not made in Canada but which have commercial importance in this country. For most of these, in order to preserve the existing pattern of preference,

as instructed by the Minister, the Board is recommending the tariff status of Free, B.P., and 15 p.c., M.F.N.,now provided for most of them.

As a result of these two sets of recommendations, the most-favoured-nation rate of 15 p.c. would apply to a very large number of chemicals, whether or not they are produced in Canada, and the incentive to seek a distinction for those made would be reduced very substantially. The two recommendations have the additional advantage of preserving the existing margins of preference for a very large number of chemicals in each category.

Some chemicals or groups of chemicals are, in important ways, subject to special circumstances which the Board has endeavoured to take into account.

For a few products, not available from Canadian production and now subject to free entry under the British Preferential Tariff but dutiable under the Most-Favoured-Nation Tariff, the Board has recommended a reduction in the M.F.N. rate where no imports of any consequence appear to have come from British preferential sources in recent years, or where imports are largely under end-use provisions, entitling them to free entry under the M.F.N. Tariff as well. In many instances in which the M.F.N. rate was higher than 15 p.c., the Board has recommended Free, B.P.,and 15 p.c., M.F.N., consistent with its more general provisions.

Some products are now admitted free of duty under the B.P. Tariff and at rates lower than 15 p.c. under the M.F.N. Tariff. In the absence of special considerations, the Board has generally recommended continuation of the existing rates, thus maintaining the existing preferential margins. It will be apparent that the continuation of a number of different rates of preference has complicated the Recommended Schedule which might otherwise have been further simplified.

Some products are now admitted free of duty under both Tariffs; for many of these, the Board is recommending continued free entry. Some products in this group are large export items admitted to their export markets free of duty or at low rates of duty and for which the producers in Canada proposed free entry into this country; for others, there appeared no clear reasons for the imposition of duties; some, for example, are of a kind not produced in Canada, without prospect of early Canadian production and neither directly competitive with nor substitutable for goods available from Canadian production.

In certain other circumstances the Board has recommended rates lower than 10 p.c., B.P., and 15 p.c., M.F.N., for products of a kind produced in Canada, when it appeared that they were in an especially favourable position: for example, because of large export sales, because of economical sources of raw materials or because of protection afforded by heavy transport charges.

One feature of the Canadian Customs Tariff which merits particular mention is the extent to which rates of duty lower than the rates which otherwise would apply are granted to specified users or for specified uses. These end-use items are the subject of discussion elsewhere in this Part of Volume 4. There the Board discusses

the reduction it is recommending in the number and extent of end-use items; this recommendation would provide greater uniformity in the rates applicable to different sectors of the industry and among other users of the products. It should thus tend to encourage a more effective structuring of Canadian production though, possibly, at some increase in costs of production in some areas now benefiting from the end-use provisions.

Of the 113 end-use tariff items within the Reference, the Board has recommended the deletion of 86, or about three-quarters. Many of these recommended deletions would naturally involve increases in rates; however, for some products where the bulk of the imports is used in Canada for the purposes mentioned in the end-use provisions, the Board has recommended duty-free entry or low rates without end-use qualification. The recommendation to retain a number of important end-use provisions, if implemented, will reduce the effective protection for many products from the level recommended for those products in the Recommended Schedule when imported for general use.

Some items in the Customs Tariff provide rate differentials based on size of package or the physical form or condition of the product. The Board generally has recommended deletion of these distinctions with respect to products within the Reference. In some cases the reason for the distinction is obscure or obsolete; in other instances, in the changed circumstances of to-day, the protection afforded by such differentials would be unreasonably high in relation to the value added by the packaging process.

Two further distinctions in the Customs Tariff, or in the administration of it, required special consideration. The first arises from differences in forms, grades or qualities of substances, frequently important in determining or describing the made-in-Canada status of the product. The second distinction arises from different sources or methods of production; some products, for example, receive different tariff treatment depending upon whether they are made from coal tar or petroleum. For products for which these distinctions now appear to have little commercial importance, the Board has recommended their elimination.

To preserve uniformity of nomenclature within its Recommended Schedule, the Board has recommended the relocation, without changes in rates of duty, of a number of products not formally brought within the scope of the Reference. For example, in a number of the recommended items, special provision is made to ensure that products properly classified in that item retain the existing rates of Free, B.P., 7½ p.c., M.F.N., which now apply to them as essential oils of tariff item 264a - an item not within the Reference.

Existing specific duties have usually been replaced, in the Board's recommendations, by ad valorem rates of duty, sometimes at a level approximating the apparent ad valorem equivalent of the existing specific rates and sometimes at other rates.

In order to avoid further complexities in a Recommended Schedule already complex, the Board has made a number of relatively small incidental changes in rates of duty, thus effecting some consolidation and simplification.

Apart from the increases in rates of duty that would arise from the deletion of end-use provisions, most of the increases in rates recommended by the Board appear in the plastics schedule. There, rates of duty have been recommended for the named resins produced in Canada, some of which are now admitted duty-free. Consequential increases were recommended for the relevant goods in later stages of processing, tending to continue as a feature of the plastics schedule the existing progression of rates of duty for different forms of synthetic resins and plastics. The progression continues up to the general provision for the final products within the Reference for which rates of 20 p.c., B.P., 20 p.c., M.F.N. have been recommended.

In the existing plastics schedule few provisions are made for preferential margins and the Board has not recommended their introduction. Accordingly, a comparison of the recommended rates in this schedule with the 10 p.c., B.P., and 15 p.c., M.F.N., recommended for a great many chemicals is difficult. The recommended increases in the rates on plastics, as well as the recommended continuation of some existing rates, would result in some rates in excess of 10 p.c., B.P., and 15 p.c., M.F.N. However, most of the basic forms of these products, even when made in Canada, would continue to be entered at rates lower than these, in many instances substantially lower.

These changes would have the effect of bringing the rates in the plastics schedule more nearly in line with those recommended for other branches of the chemical industry and take account of the very great expansion in the plastics industry since the Board's former recommendations for this group of products.

The changes in rates in the plastics schedule are discussed more fully in the Summary and Conclusions on Recommended Items 39.01 and 39.02 in Volume 4, Part I. Similarly, the recommended rates on many chemicals, particularly those which are the subject of special considerations, are discussed specifically in the relevant Summary and Conclusions in Volume 4, Part I.

General Tariff

The foregoing discussion has related to rates under the B.P. and M.F.N. Tariffs. Imports of goods within the scope of this Reference from countries whose products are subject to the General Tariff have been negligible in recent years.

Under the terms of the Trade Agreement with the West Indies, though products from that area enjoy the benefits of the British Preferential Tariff, nevertheless duties on most of such products may not be levied at more than 50 per cent of the General rate. There are many items within the Reference which now bear rates of 15 p.c., B.P., and 25 p.c., G.T.; under these items the West Indies, being entitled to entry at 12½ p.c. (50 per cent of the General rate), thus have an additional preference of 2½ per cent. Many of the goods classified in these items would become dutiable at rates of 10 p.c., B.P., and 25 p.c., G.T.; under such new Recommended Items, though the West Indies will benefit by entry at 10 p.c. instead of 12½ p.c., they will nevertheless no longer enjoy any additional preference beyond that accorded to other British Preferential countries. However, ammonia appears to be the only product within the scope of the

Reference which has been imported in volume from the West Indies in recent years and most of the imports are believed to have been entered free of duty under end-use item 663b providing free entry under all Tariffs for goods entering into the cost of the manufacture of fertilizers; this end-use provision, with slightly enlarged coverage, would be continued in Recommended Item R-31 663b; ammonia for direct use as a fertilizer would also be entered free of duty under all Tariffs under Recommended Item 31.00(1); however, for general use not covered by an end-use item, ammonia would become dutiable at 10 p.c., B.P., and 25 p.c., G.T., under Recommended Item 28.16, whereas, for such general use, it is now dutiable at 15 p.c., B.P., and 25 p.c, G.T., under tariff item 711.

The Board has usually retained a margin between the M.F.N. and General rates by recommending, for the latter Tariff, the rate of 25 p.c., the rate now applicable under many of the major tariff items included in the Reference. To some extent, the Board has sought to achieve greater uniformity in the General Tariff by use of the 25 p.c. rate. In cases, however, where there was free entry under the General Tariff, or where rates lower than 25 p.c. were applicable, the Board has often recommended continuation of the existing rate provisions or other rates lower than 25 p.c.

APPENDIX I

NOTE: Most of the data in the accompanying tables are derived from Dominion Bureau of Statistics publications; some of the data have been adjusted, for the years 1957 to 1966, to bring them closer to a Reference 120 basis. Because of important changes made by D.B.S. during the past few years in the classification of industries and commodities and in the compilation of data, some continuity or comparability is lost in historical series.

STATISTICAL TABLES

Table 1

PRINCIPAL STATISTICS FOR THE CHEMICAL AND CHEMICAL PRODUCTS INDUSTRIES(a), 1959 TO 1965(b)

Year	Establishments No.	Employees No.	Salaries & Wages $'000	Cost of Fuel & Electricity $'000	Cost of Materials Used $'000	Value Added by Manufacture $'000	Selling Value of Factory Shipments $'000
				Total			
1959	1,125	54,253	241,048	50,493	579,800	693,566	1,323,859
1960	1,143	54,269	253,231	54,894	582,843	747,753	1,373,467
1961	1,072	52,167	254,004	54,694	623,944	760,928	1,433,878
1962	1,080	50,879	253,483	56,047	666,728	824,592(c)	1,543,371(c)
1963	1,093	62,154	330,173	59,897	719,704	870,647	1,644,786
1964	1,140	63,844	350,848	63,677	797,816	936,459(d)	1,797,952
1965	1,102	65,544	372,543	69,553	867,467	981,915(d)	1,918,935
				Explosives & Ammunition Manufacturers			
1959	14	5,739	24,294	1,725	36,775	37,373	75,873
1960	12	5,249	23,793	1,708	27,506	39,358	67,123
1961	14	4,660	22,293	1,722	25,586	31,864	63,353
1962	15	3,761	17,994	1,601	25,419	32,763	61,336
1963	16	3,596	17,993	1,674	22,525	32,204	56,912
1964	16	3,778	19,187	1,823	26,784	38,386(d)	66,993
1965	15	3,656	18,594	1,729	25,008	37,401(d)	64,138
				Manufacturers of Mixed Fertilizers			
1959	40	1,198	5,081	443	30,762	13,430	44,635
1960	42	1,194	5,616	497	32,550	12,798	45,860
1961	43	1,378	6,602	719	39,648	14,426	54,261
1962	45	1,341	5,930	1,037	44,249	16,142	59,618
1963	46	1,583	7,631	1,063	48,065	18,413	67,981
1964	61	1,752	8,701	1,270	59,948	18,808(d)	80,026
1965	63	1,873	9,382	1,411	65,551	15,756(d)	82,718

Table 1 (Cont'd)

Year	Establishments No.	Employees No.	Salaries & Wages $'000	Cost of Fuel & Electricity $'000	Cost of Materials Used $'000	Value Added by Manufacture $'000	Selling Value of Factory Shipments $'000
			Manufacturers of Plastics & Synthetic Resins				
1959	31	3,257	16,218	3,254	56,112	40,633	99,999
1960	33	4,000	21,271	4,835	68,631	56,943	128,658
1961	31	3,325	18,507	3,656	60,259	48,104	110,345
1962	28	3,267	18,503	3,814	65,747	59,832(c)	128,071(c)
1963	29	3,620	20,984	3,960	70,412	64,033	139,085
1964	34	3,769	22,745	4,238	76,098	75,362(d)	155,698
1965	32	4,057	24,830	4,415	84,040	62,950(d)	151,405
			Manufacturers of Pharmaceuticals & Medicines				
1959	184	7,974	30,451	1,062	46,780	111,207	159,049
1960	198	7,994	31,899	1,078	45,550	118,517	164,897
1961	175	7,602	31,744	1,046	49,785	116,705	166,016
1962	167	7,577	32,898	1,085	51,684	123,060	175,249
1963	173	10,418	52,708	1,187	54,483	139,307	193,718
1964	175	10,644	56,124	1,288	62,164	143,564(d)	207,016
1965	161	11,091	60,852	1,308	72,247	156,287(d)	229,842
			Paint & Varnish Manufacturers				
1959	138	6,280	26,394	984	72,475	74,234	147,693
1960	139	6,164	27,667	1,031	74,265	72,544	147,476
1961	136	5,802	25,843	1,050	75,066	76,844	152,358
1962	142	5,480	24,611	1,073	79,713	80,640	160,462
1963	145	7,511	36,618	1,091	85,967	85,300	171,752
1964	151	7,738	38,845	1,150	94,824	87,869(d)	183,843
1965	148	7,244	39,264	1,185	94,888	86,405(d)	182,478

Table 1 (Cont'd)

Year	Establishments No.	Employees No.	Salaries & Wages $'000	Cost of Fuel & Electricity $'000	Cost of Materials Used $'000	Value Added by Manufacture $'000	Selling Value of Factory Shipments $'000
				Manufacturers of Soaps & Cleaning Compounds			
1959	137	3,820	17,598	1,492	56,825	77,088	135,406
1960	134	3,983	19,025	1,437	56,410	80,519	139,279
1961	126	4,145	21,859	1,676	82,893	86,989	172,334
1962	136	4,946	26,836	1,725	87,713	92,251	179,057
1963	139	5,958	33,972	1,795	86,008	93,033	180,530
1964	140	5,677	33,824	1,717	88,569	92,365(d)	182,651
1965	128	5,856	35,588	1,807	92,704	101,782(d)	196,293
				Manufacturers of Toilet Preparations			
1959	84	2,770	8,919	214	21,641	38,283	60,138
1960	84	2,636	9,318	227	22,671	44,459	67,200
1961	73	2,646	9,613	237	22,949	45,555	68,814
1962	74	2,741	10,128	266	25,431	49,903	74,825
1963	64	3,814	16,534	255	28,047	54,636	82,272
1964	66	4,044	18,229	303	30,375	59,491(d)	90,169
1965	65	4,238	19,608	300	32,103	66,212(d)	98,615
				Manufacturers of Industrial Chemicals			
1959	132	16,521	84,422	38,667	180,967	224,881	444,515
1960	131	16,371	86,443	41,542	177,272	239,141	449,983
1961	128	16,191	89,364	42,023	182,032	260,137	476,603
1962	126	15,290	87,621	42,756	190,967	280,908	517,199
1963	129	17,587	102,935	46,115	221,067	290,194	553,762
1964	132	18,045	109,190	49,075	247,626	320,869(d)	617,570
1965	137	18,892	118,123	54,311	277,396	334,453(d)	666,160

Table 1 (Cont'd)

Year	Establishments No.	Employees No.	Salaries & Wages $'000	Cost of Fuel & Electricity $'000	Cost of Materials Used $'000	Value Added by Manufacture $'000	Selling Value of Factory Shipments $'000
			Manufacturers of Printing Inks				
1959	33	911	3,934	161	7,713	9,567	17,441
1960	33	940	4,242	174	7,611	9,760	17,401
1961	32	971	4,622	193	8,362	10,571	19,074
1962	34	1,012	4,731	191	8,613	11,535	20,056
1963	35	1,215	6,402	205	8,981	11,353	20,377
1964	37	1,242	6,876	220	10,009	10,730(d)	20,959
1965	38	1,299	7,598	254	10,972	13,171(d)	24,397
			Other Chemical Industries, n.e.s.				
1959	332	5,783	23,738	2,491	69,750	66,870	139,111
1960	337	5,738	23,957	2,365	70,377	73,714	145,590
1961	314	5,447	23,550	2,370	77,364	72,553	150,719
1962	313	5,464	24,231	2,499	87,192	77,558	167,498
1963	317	6,852	34,396	2,552	94,150	82,174	178,398
1964	328	7,155	37,127	2,593	101,419	89,015(d)	193,027
1965	315	7,338	38,705	2,834	112,558	107,498(d)	222,890

(a) Based on the New Establishment Concept (1961) and the revised Standard Industrial Classification, (1960)
(b) 1965 data are preliminary
(c) Revised in 1963
(d) Value added for 1964 and 1965 is based on shipments data not adjusted for inventory change

Source: D.B.S., Cat. Nos. 46-201 and 46-217

Table 2

PRINCIPAL STATISTICS FOR THE CHEMICALS AND ALLIED PRODUCTS INDUSTRIES, SELECTED YEARS, 1929 TO 1959

Year	Establishments No.	Employees No.	Salaries & Wages $'000	Cost of Fuel & Electricity $'000	Cost of Materials Used $'000	Value Added by Manufacture $'000	Selling Value of Factory Shipments $'000
				Total			
1929	562	16,933	22,967	4,639	60,763	79,646	145,048
1939	817	22,834	31,841	5,321	68,241	90,131	163,693
1949	1,037	41,328	100,691	19,218	280,009	288,171	587,398
1950	1,033	41,475	106,794	21,998	307,706	317,167	646,871
1951	1,037	45,664	131,310	25,506	366,958	384,026	776,489
1952	1,075	47,694	148,076	24,656	357,819	414,088	796,562
1953	1,105	50,207	164,591	29,541	403,686	448,277	881,504
1954	1,116	51,603	177,312	32,213	437,051	476,125	935,725
1955	1,126	51,856	185,268	33,086	480,104	528,929	1,044,079
1956	1,131	52,821	200,743	36,639	527,564	556,241	1,111,233
1957	1,137	54,708	222,044	42,102	565,746	605,274	1,203,411
1958	1,143	54,570	233,819	47,837	589,316	664,853	1,293,332
1959	1,137	54,782	243,218	50,592	627,366	701,480	1,378,211

Table 2 (Cont'd)

Year	Establishments No.	Employees No.	Salaries & Wages $'000	Cost of Fuel & Electricity $'000	Cost of Materials Used $'000	Value Added by Manufacture $'000	Selling Value of Factory Shipments $'000
				Acids, Alkalies and Salts			
1929	15	2,897	4,339	2,921	6,301	18,800	28,022
1939	25	3,128	5,033	2,548	6,022	14,487	23,057
1949	28	5,861	16,505	7,355	27,393	39,664	74,412
1950	28	6,020	18,039	8,639	30,328	48,527	87,494
1951	29	7,371	24,579	11,128	39,239	67,456	117,823
1952	29	7,591	27,208	11,167	37,777	65,243	114,188
1953	41	8,278	31,174	13,264	43,083	70,952	127,299
1954	43	8,408	33,426	13,358	49,401	79,376	142,002
1955	45	8,597	35,548	15,034	61,687	95,024	172,256
1956	48	9,083	40,665	17,194	85,088	96,705	193,541
1957	54	9,981	46,966	20,384	95,238	104,278	215,834
1958	59	10,073	49,780	24,563	111,593	126,832	260,968
1959	57	10,452	53,528	27,986	127,362	142,410	297,482
				Fertilizers			
1929	12	251	266	17	1,450	791	2,259
1939	27	1,211	1,820	706	8,140	4,319	13,165
1949	32	3,269	9,005	1,772	31,671	33,984	67,428
1950	36	3,253	9,423	1,996	33,350	33,651	68,997
1951	39	3,218	10,310	1,767	35,294	37,428	74,489
1952	39	3,205	11,325	1,887	38,450	38,406	78,743
1953	40	3,199	11,512	1,949	39,310	43,095	84,354
1954	38	3,049	11,603	2,992	41,275	39,655	78,149
1955	39	2,935	11,542	2,642	41,397	45,895	92,499
1956	45	2,958	11,757	2,700	43,295	37,344	83,399
1957	44	3,011	12,899	3,151	47,134	35,459	83,808
1958	45	2,993	13,425	3,281	48,594	37,209	89,146
1959	45	3,001	13,805	3,355	50,470	40,733	96,278

Table 2 (Cont'd)

Year	Establishments No.	Employees No.	Salaries & Wages $'000	Cost of Fuel & Electricity $'000	Cost of Materials Used $'000	Value Added by Manufacture $'000	Selling Value of Factory Shipments $'000
Medicinal & Pharmaceutical Preparations							
1929	140	2,849	3,672	110	6,301	12,628	19,039
1939	174	4,388	5,907	200	9,805	17,180	27,184
1949	218	7,658	16,117	593	22,901	48,008	71,502
1950	210	7,524	16,638	653	24,621	51,099	76,373
1951	206	7,481	18,918	719	28,415	60,115	89,249
1952	213	7,457	20,482	752	27,350	59,921	88,022
1953	217	7,492	21,759	822	30,716	62,019	93,557
1954	216	7,380	22,648	865	31,258	66,414	97,396
1955	210	7,629	23,937	871	33,820	72,703	108,122
1956	212	7,801	25,953	924	38,009	83,300	122,592
1957	207	8,146	28,656	1,072	42,337	97,277	140,093
1958	196	7,996	29,847	1,084	44,289	111,162	155,006
1959	188	8,146	31,134	1,075	48,511	116,977	164,733
Paints, Pigments & Varnishes							
1929	69	2,851	4,260	352	12,415	14,337	27,103
1939	93	3,540	5,312	331	12,081	13,443	25,856
1949	112	6,035	14,138	622	42,428	39,810	82,861
1950	109	5,929	14,569	682	49,870	42,446	92,999
1951	114	5,859	16,129	708	55,701	48,430	104,839
1952	116	5,784	17,220	733	53,119	53,554	107,406
1953	122	5,887	19,238	756	55,144	57,347	113,248
1954	124	5,719	19,625	831	55,061	51,899	107,727
1955	122	5,994	20,768	875	59,785	58,246	117,184
1956	126	6,211	22,713	970	65,156	60,439	126,312
1957	129	6,316	24,288	1,003	65,591	64,528	131,133
1958	131	6,234	25,222	963	70,561	73,064	143,097
1959	134	6,340	26,624	986	72,960	74,317	148,619

Table 2 (Cont'd)

Year	Establishments No.	Employees No.	Salaries & Wages $'000	Cost of Fuel & Electricity $'000	Cost of Materials Used $'000	Value Added by Manufacture $'000	Selling Value of Factory Shipments $'000
				Primary Plastics			
1929	..	..	..	..	..	..	..
1939	..	..	..	..	..	..	..
1949	14	1,286	3,496	461	10,897	9,664	21,022
1950	14	1,392	3,965	603	14,001	16,124	30,728
1951	16	1,648	5,403	707	20,571	18,092	39,370
1952	16	1,850	6,505	735	18,775	15,129	34,639
1953	19	2,160	7,916	904	24,498	19,140	44,542
1954	22	2,808	11,191	1,686	30,974	26,892	58,882
1955	23	3,036	12,333	1,491	40,265	33,761	75,052
1956	25	3,260	13,855	1,703	46,912	34,887	82,739
1957	29	3,443	15,710	1,996	48,089	42,458	91,837
1958	34	3,435	16,255	2,832	52,092	42,566	97,802
1959	34	3,469	17,080	3,330	57,803	43,779	103,539
				Soaps, Washing Compounds, etc.			
1929	61	1,854	2,579	271	11,002	7,946	19,219
1939	110	2,406	3,142	377	9,171	10,597	20,145
1949	143	3,637	9,374	964	31,029	30,405	62,398
1950	142	3,735	10,340	1,093	34,750	30,205	66,048
1951	130	3,742	11,506	1,018	41,758	30,943	73,719
1952	136	3,756	12,755	1,080	35,013	48,368	84,461
1953	141	3,824	13,126	1,194	38,323	49,731	89,249
1954	141	3,756	13,562	1,250	41,125	50,836	92,526
1955	141	3,827	14,047	1,284	44,919	54,285	100,105
1956	142	3,722	14,514	1,325	45,955	63,128	109,385
1957	139	3,680	15,411	1,373	49,530	69,748	118,873
1958	137	3,882	17,021	1,516	55,531	76,078	132,023
1959	134	4,029	18,372	1,482	57,141	76,922	137,078

Table 2 (Cont'd)

Year	Establish-ments No.	Employees No.	Salaries & Wages $'000	Cost of Fuel & Electricity $'000	Cost of Mater-ials Used $'000	Value Added by Manufacture $'000	Selling Value of Factory Shipments $'000
				Toilet Preparations			
1929	49	577	667	14	1,578	2,860	4,452
1939	86	1,135	1,305	27	2,793	4,099	6,919
1949	94	1,720	3,009	74	7,088	11,885	19,047
1950	98	1,862	3,424	90	7,680	13,181	20,951
1951	97	1,800	3,775	100	8,224	14,211	22,535
1952	101	1,870	4,245	115	9,720	17,224	27,060
1953	94	1,955	4,649	122	11,309	19,007	30,438
1954	94	2,048	5,147	120	12,197	19,878	31,943
1955	98	2,166	5,890	143	13,843	23,029	36,849
1956	91	2,288	6,402	158	16,362	25,296	41,325
1957	86	2,429	7,230	181	18,532	31,173	49,838
1958	83	2,393	7,361	198	18,628	33,659	51,856
1959	82	2,605	8,250	202	19,949	35,024	54,537
				Vegetable Oils			
1929	8	239	327	64	5,579	860	6,503
1939	9	239	273	62	3,100	995	4,157
1949	15	829	2,122	477	41,632	9,133	51,242
1950	15	792	2,155	524	40,213	6,289	47,027
1951	13	751	2,317	624	48,729	10,849	60,202
1952	13	723	2,428	581	44,479	6,872	51,932
1953	13	675	2,346	492	43,992	6,359	50,843
1954	12	668	2,462	629	45,088	8,206	53,121
1955	12	682	2,504	694	42,018	7,017	50,322
1956	12	672	2,584	523	37,107	5,444	42,239
1957	11	656	2,663	756	50,899	8,925	60,952
1958	11	614	2,675	819	45,503	8,157	53,795
1959	10	625	2,853	845	46,989	9,915	57,677

Table 2 (Cont'd)

Year	Establishments No.	Employees No.	Salaries & Wages $'000	Cost of Fuel & Electricity $'000	Cost of Materials Used $'000	Value Added by Manufacture $'000	Selling Value of Factory Shipments $'000
				Inks, Printing & Writing			
1929	22	392	786	30	1,097	1,911	3,038
1939	33	543	956	42	1,465	1,948	3,455
1949	32	704	1,969	63	4,002	4,874	8,940
1950	30	796	2,230	80	4,571	5,567	10,218
1951	34	828	2,452	85	5,208	5,289	10,583
1952	34	854	2,584	89	4,839	5,995	10,924
1953	33	891	2,891	108	5,198	7,517	12,823
1954	33	964	3,167	115	5,145	8,246	13,396
1955	35	996	3,417	126	5,904	8,739	14,748
1956	33	994	3,755	145	6,780	9,076	15,903
1957	32	977	4,015	137	6,936	9,972	16,912
1958	42	1,015	4,060	158	7,487	9,837	17,482
1959	44	1,067	4,457	180	8,548	10,790	19,476
				Adhesives			
1929	13	267	321	68	963	800	1,831
1939	19	427	521	90	905	1,116	2,111
1949	25	749	1,728	340	4,218	3,266	7,825
1950	28	669	1,723	365	5,086	4,228	9,679
1951	29	714	1,972	369	6,280	4,787	11,437
1952	30	706	2,129	367	6,106	4,365	10,839
1953	29	707	2,145	403	6,491	5,188	12,082
1954	28	621	1,987	368	6,214	5,946	12,773
1955	29	576	1,935	370	5,031	5,368	10,909
1956	29	611	2,153	412	5,424	6,457	12,330
1957	29	627	2,322	456	6,475	6,720	13,708
1958	28	642	2,557	439	7,121	6,873	14,381
1959	31	629	2,684	371	7,598	6,807	14,639

Table 2 (Cont'd)

Year	Establishments No.	Employees No.	Salaries & Wages $'000	Cost of Fuel & Electricity $'000	Cost of Materials Used $'000	Value Added by Manufacture $'000	Selling Value of Factory Shipments $'000
				Polishes & Dressings			
1929	29	216	280	9	631	716	1,356
1939	49	468	565	22	1,580	1,859	3,462
1949	57	797	1,656	78	5,919	5,869	11,865
1950	54	782	1,715	76	6,325	6,977	13,377
1951	49	800	1,853	77	6,399	6,768	13,245
1952	51	751	1,929	102	7,735	8,130	15,966
1953	49	845	2,402	95	7,705	9,430	17,230
1954	50	850	2,587	103	7,884	9,802	17,718
1955	48	805	2,564	100	8,747	10,413	19,606
1956	45	828	2,822	135	9,769	11,259	20,847
1957	44	842	3,075	138	10,027	12,084	22,324
1958	43	833	3,302	140	10,705	13,606	24,508
1959	42	832	3,466	147	10,923	13,874	24,724
				Gases, Compressed			
1929	28	542	770	156	785	3,026	3,967
1939	31	672	1,038	156	502	3,352	4,010
1949	48	1,223	3,231	432	1,979	9,680	12,091
1950	50	1,240	3,240	493	1,874	10,370	12,737
1951	51	1,247	3,681	582	2,409	12,388	15,378
1952	47	1,250	3,890	468	2,426	13,307	16,201
1953	45	1,226	4,047	491	2,240	12,981	15,712
1954	46	1,305	4,355	513	2,623	12,747	15,873
1955	52	1,387	4,760	592	2,943	12,986	16,502
1956	53	1,399	5,083	698	3,452	16,828	20,973
1957	55	1,624	5,976	750	4,125	19,619	24,281
1958	57	1,477	6,384	769	3,991	18,796	23,742
1959	57	1,504	6,658	987	4,537	21,594	27,076

Table 2 (Cont'd)

Year	Establishments No.	Employees No.	Salaries & Wages $'000	Cost of Fuel & Electricity $'000	Cost of Materials Used $'000	Value Added by Manufacture $'000	Selling Value of Factory Shipments $'000
			Coal Tar Distillation				
1929	10	242	354	123	2,659	1,036	3,818
1939	11	302	394	164	2,109	1,376	3,648
1949	11	415	1,167	549	4,787	3,997	9,333
1950	11	457	1,274	633	6,057	3,343	10,033
1951	11	468	1,443	669	7,077	4,331	12,077
1952	11	500	1,679	656	7,143	4,835	12,634
1953	11	541	1,861	755	7,551	5,329	13,635
1954	11	544	2,102	656	7,418	4,752	12,878
1955	11	528	2,081	612	7,011	4,802	11,893
1956	11	537	2,458	704	8,049	4,549	13,221
1957	11	530	2,600	771	8,200	4,810	13,664
1958	10	572	2,761	744	7,612	3,463	12,018
1959	8	491	2,752	748	7,647	4,850	13,267
			Miscellaneous Chemical Products				
1929	70	1,742	2,076	127	4,291	5,703	10,121
1939	145	4,196	5,430	507	10,243	15,040	25,789
1949	208	7,145	17,175	5,436	44,065	37,931	87,433
1950	208	7,024	18,060	6,070	48,981	45,158	100,209
1951	219	9,737	26,972	6,953	61,654	62,937	131,543
1952	239	11,397	33,695	5,924	64,886	72,736	143,547
1953	251	12,527	39,525	8,185	88,125	80,180	176,490
1954	258	13,483	43,449	8,727	101,390	91,476	201,340
1955	261	12,698	43,943	8,254	112,736	96,659	218,032
1956	259	12,457	46,029	9,047	116,207	101,530	226,428
1957	267	12,446	50,233	9,933	112,633	98,223	220,155
1958	267	12,411	53,170	10,330	105,609	103,550	217,508
1959	271	11,592	51,555	8,899	106,928	103,490	219,086

Source: D.B.S., Cat. No. 46-201

Table 3

PRINCIPAL STATISTICS FOR THE CHEMICAL & CHEMICAL PRODUCTS INDUSTRIES(a), BY PROVINCES, SELECTED YEARS, 1929 TO 1965

	Establishments No.	Employees No.	Salaries & Wages $'000	Cost of Fuel & Electricity $'000	Cost of Materials Used $'000	Value Added by Manufacture $'000	Selling Value of Factory Shipments $'000
1929							
P.E.I. & Nova Scotia	11	243	252	51	1,023	1,257	2,280
New Brunswick	8	84	118	21	739	327	1,066
Quebec	163	5,814	7,211	1,248	16,041	25,828	41,869
Ontario	297	9,260	13,315	3,108	32,209	49,329	81,538
Manitoba	31	625	817	64	2,396	2,992	5,387
Sask. & Alberta	9	80	115	10	417	326	743
British Columbia	38	588	811	74	2,360	3,301	5,662
Canada	557	16,694	22,639	4,575	55,184	83,361	138,545
1939							
P.E.I. & Nova Scotia	14	320	358	62	1,381	1,137	2,580
New Brunswick	7	172	237	29	1,410	832	2,271
Quebec	251	8,294	10,888	1,421	20,247	27,135	48,803
Ontario	424	11,726	17,033	2,896	35,761	51,333	89,989
Manitoba	38	615	776	73	2,018	2,279	4,370
Sask. & Alberta	24	165	215	22	391	550	962
British Columbia	50	1,303	2,060	757	4,023	5,782	10,562
Canada	808	22,595	31,568	5,259	65,231	89,047	159,537

Table 3 (Cont'd)

	Establish-ments No.	Employees No.	Salaries & Wages $'000	Cost of Fuel & Electricity $'000	Cost of Materials Used $'000	Value Added by Manufacture $'000	Selling Value of Factory Shipments $'000
1949							
Newfoundland	8	95	187	12	628	313	953
P.E.I. & Nova Scotia	17	355	772	136	4,244	2,728	7,108
New Brunswick	7	145	354	64	3,445	1,011	4,520
Quebec	334	15,514	36,349	4,258	76,966	86,099	167,323
Ontario	531	21,153	52,651	13,524	158,607	158,365	330,496
Manitoba	42	768	1,530	124	7,298	5,822	13,244
Saskatchewan	11	220	578	49	4,115	1,411	5,575
Alberta	20	599	1,592	713	3,452	5,154	9,319
British Columbia	67	2,479	6,678	338	21,253	27,269	48,860
Canada	1,037	41,328	100,691	19,218	280,009	288,171	587,398
1950							
Newfoundland	6	75	151	14	558	416	988
P.E.I. & Nova Scotia	17	344	785	145	4,218	2,073	6,436
New Brunswick	7	136	346	57	3,238	998	4,293
Quebec	336	15,159	38,229	5,249	86,464	95,553	187,266
Ontario	515	21,755	56,721	15,182	180,932	179,782	375,896
Manitoba	44	761	1,567	133	6,872	5,065	12,070
Saskatchewan	11	233	579	36	1,300	648	1,984
Alberta	21	575	1,613	840	2,322	5,168	8,331
British Columbia	76	2,437	6,802	343	21,802	27,462	49,607
Canada	1,033	41,475	106,794	21,998	307,706	317,167	646,871

Table 3 (Cont'd)

	Establishments No.	Employees No.	Salaries & Wages $'000	Cost of Fuel & Electricity $'000	Cost of Materials Used $'000	Value Added by Manufacture $'000	Selling Value of Factory Shipments $'000
1951							
Newfoundland	6	74	160	13	659	316	988
P.E.I. & Nova Scotia	17	333	837	162	4,553	2,893	7,607
New Brunswick	7	132	331	55	2,786	852	3,693
Quebec	339	18,382	50,655	7,245	103,605	122,869	233,720
Ontario	513	22,762	67,420	16,745	217,923	212,596	447,264
Manitoba	42	735	1,649	142	7,311	5,366	12,819
Saskatchewan	8	163	500	28	994	820	1,842
Alberta	24	613	1,965	750	2,867	6,274	9,891
British Columbia	81	2,470	7,793	366	26,259	32,039	58,664
Canada	1,037	45,664	131,310	25,506	366,958	384,026	776,489
1952							
Newfoundland	5	75	188	15	637	545	1,197
P.E.I. & Nova Scotia	18	340	916	173	4,447	3,253	7,872
New Brunswick	7	158	448	61	2,957	1,279	4,297
Quebec	346	19,604	58,228	6,968	101,064	124,798	232,830
Ontario	538	23,503	75,360	16,072	212,189	237,758	466,018
Manitoba	43	726	1,751	136	6,960	5,505	12,602
Saskatchewan	8	160	540	25	531	715	1,270
Alberta	24	650	2,188	816	3,605	6,609	11,031
British Columbia	86	2,478	8,458	391	25,428	33,626	59,445
Canada	1,075	47,694	148,076	24,656	357,819	414,088	796,562

Table 3 (Cont'd)

	Establishments No.	Employees No.	Salaries & Wages $'000	Cost of Fuel & Electricity $'000	Cost of Materials Used $'000	Value Added by Manufacture $'000	Selling Value of Factory Shipments $'000
1953							
Newfoundland	6	71	224	18	642	634	1,294
P.E.I. & Nova Scotia	18	334	917	156	4,112	3,319	7,587
New Brunswick	7	157	467	60	3,927	1,779	5,766
Quebec	368	20,649	65,535	8,093	134,027	138,896	281,016
Ontario	539	24,587	82,619	19,455	225,308	252,969	497,732
Manitoba	41	701	1,756	142	6,894	5,923	12,959
Saskatchewan	8	172	625	31	1,156	889	2,076
Alberta	27	1,077	3,834	1,163	4,977	8,442	14,582
British Columbia	91	2,459	8,614	422	22,644	35,425	58,491
Canada	1,105	50,207	164,591	29,541	403,686	448,277	881,504
1954							
Newfoundland	6	78	215	17	616	652	1,289
P.E.I. & Nova Scotia	18	317	892	126	3,973	2,717	6,944
New Brunswick	7	147	429	62	2,810	1,080	4,014
Quebec	367	21,647	71,384	9,088	144,826	157,777	311,816
Ontario	550	24,725	86,759	19,285	239,579	257,894	513,633
Manitoba	41	698	1,890	160	6,630	5,205	11,934
Saskatchewan	9	199	698	40	2,217	1,531	3,257
Alberta	31	1,427	6,018	1,900	10,089	15,475	25,923
British Columbia	87	2,365	9,027	1,536	26,310	33,793	56,914
Canada	1,116	51,603	177,312	32,213	437,051	476,125	935,725

Table 3 (Cont'd)

	Establish-ments No.	Employees No.	Salaries & Wages $'000	Cost of Fuel & Electricity $'000	Cost of Materials Used $'000	Value Added by Manufacture $'000	Selling Value of Factory Shipments $'000
1955							
Newfoundland	5	78	224	19	742	689	1,430
P.E.I. & Nova Scotia	18	319	890	138	4,129	2,851	7,008
New Brunswick	7	131	441	65	3,116	1,139	4,211
Quebec	371	21,236	73,976	9,075	159,643	166,549	334,498
Ontario	553	25,137	90,765	20,353	266,606	291,453	578,134
Manitoba	38	743	1,970	161	6,748	5,067	12,124
Saskatchewan	10	200	743	23	2,256	542	3,171
Alberta	31	1,513	6,718	2,132	11,822	21,822	36,865
British Columbia	93	2,499	9,541	1,120	25,041	38,816	66,638
Canada	1,126	51,856	185,268	33,086	480,104	528,929	1,044,079
1956							
Newfoundland	5	78	208	21	831	653	1,469
P.E.I. & Nova Scotia	18	328	950	163	4,233	2,822	7,395
New Brunswick	9	149	468	84	3,118	1,200	4,566
Quebec	365	21,194	79,090	10,013	178,640	169,486	356,932
Ontario	558	25,893	99,578	22,828	290,183	316,987	623,257
Manitoba	37	744	2,165	175	7,840	6,129	14,013
Saskatchewan	9	200	780	31	2,612	1,092	3,674
Alberta	32	1,703	7,636	2,203	12,921	23,193	35,356
British Columbia	98	2,532	9,867	1,122	27,186	34,679	64,571
Canada	1,131	52,821	200,743	36,639	527,564	556,241	1,111,233

Table 3 (Cont'd)

	Establish-ments No.	Employees No.	Salaries & Wages $'000	Cost of Fuel & Electricity $'000	Cost of Materials Used $'000	Value Added by Manufacture $'000	Selling Value of Factory Shipments $'000
1957							
Newfoundland	5	77	216	21	754	735	1,511
P.E.I & Nova Scotia	17	329	1,013	191	4,332	3,138	7,306
New Brunswick	9	150	473	90	3,070	1,307	4,345
Quebec	372	21,835	87,169	12,054	171,521	183,015	365,901
Ontario	554	26,836	111,182	25,465	329,778	352,477	702,384
Manitoba	37	749	2,258	183	8,363	7,448	16,164
Saskatchewan	9	223	904	38	2,850	1,386	4,159
Alberta	36	1,940	8,495	2,577	17,230	26,033	42,956
British Columbia	98	2,569	10,335	1,482	27,848	29,735	58,686
Canada	1,137	54,708	222,044	42,102	565,746	605,274	1,203,411
1958							
Newfoundland	6	82	271	23	913	1,055	1,997
P.E.I. & Nova Scotia	17	337	1,055	160	4,353	2,975	7,645
New Brunswick	7	143	496	78	3,062	1,267	4,886
Quebec	373	21,346	89,236	12,653	170,467	211,402	390,656
Ontario	555	27,327	119,560	29,889	350,199	374,548	750,577
Manitoba	37	728	2,439	198	9,218	8,499	17,747
Saskatchewan	10	215	956	38	3,002	1,308	4,360
Alberta	37	1,836	8,738	2,726	17,956	28,411	49,114
British Columbia	101	2,556	11,069	2,072	30,146	35,388	66,350
Canada	1,143	54,570	233,819	47,837	589,316	664,853	1,293,332

Table 3 (Cont'd)

	Establish-ments No.	Employees No.	Salaries & Wages $'000	Cost of Fuel & Electricity $'000	Cost of Materials Used $'000	Value Added by Manufacture $'000	Selling Value of Factory Shipments $'000
1959							
Newfoundland	4	70	252	23	828	898	1,749
P.E.I & Nova Scotia	18	317	1,081	167	4,439	3,546	8,151
New Brunswick	8	146	502	68	2,950	1,863	4,881
Quebec	364	21,044	91,597	13,172	178,602	216,098	407,872
Ontario	549	27,425	124,442	31,724	337,490	390,059	759,273
Manitoba	33	666	2,365	132	7,557	7,650	15,340
Saskatchewan	9	82	354	31	1,554	1,215	2,800
Alberta	37	1,890	8,868	2,857	18,935	34,167	55,959
B.C. & N.W.T.	103	2,613	11,586	2,318	27,445	38,070	67,833
Canada	1,125	54,253	241,048	50,493	579,800	693,566	1,323,859
1960(b)							
Newfoundland	3	69	257	22	782	922	1,690
P.E.I. & Nova Scotia	15	301	1,046	173	4,308	3,541	8,095
New Brunswick	8	132	524	62	3,386	1,480	4,803
Quebec	368	20,074	92,107	13,697	167,397	234,637	414,345
Ontario	562	28,440	134,580	34,870	345,171	424,756	798,813
Manitoba	35	649	2,420	146	7,758	7,946	15,643
Saskatchewan	10	92	412	41	1,665	1,536	3,213
Alberta	40	1,903	9,808	3,290	20,961	35,325	58,444
B.C. & N.W.T.	102	2,609	12,076	2,592	31,415	37,612	68,419
Canada	1,143	54,269	253,231	54,894	582,843	747,753	1,373,467

Table 3 (Cont'd)

	Establish-ments No.	Employees No.	Salaries & Wages $'000	Cost of Fuel & Electricity $'000	Cost of Materials Used $'000	Value Added by Manufacture $'000	Selling Value of Factory Shipments $'000
1961							
Newfoundland & P.E.I.	4	109	383	32	2,526	1,326	3,964
Nova Scotia	15	228	844	152	2,582	3,336	5,857
New Brunswick	7	143	527	63	3,792	1,387	5,334
Quebec	340	18,742	89,700	13,844	165,439	224,934	406,438
Ontario	528	27,789	137,651	34,197	385,642	445,483	861,064
Manitoba	33	701	2,607	152	9,061	8,682	17,614
Saskatchewan	9	78	312	32	1,066	1,326	2,287
Alberta	36	1,860	9,984	3,502	21,999	33,765	59,459
B.C. & N.W.T.	100	2,517	11,996	2,720	31,837	40,689	71,861
Canada	1,072	52,167	254,004	54,694	623,944	760,928	1,433,878
1962(c)							
Newfoundland & P.E.I.	4	104	397	34	2,685	1,427	4,137
Nova Scotia	16	211	853	130	3,081	2,589	5,787
New Brunswick	9	139	525	64	3,793	1,484	5,335
Quebec	337	16,402	77,872	12,392	169,147	235,768	416,312
Ontario	535	29,028	148,877	36,683	417,728	484,473	936,842
Manitoba	34	600	2,271	151	9,323	9,153	18,588
Saskatchewan	8	71	277	21	1,103	1,154	2,272
Alberta	33	1,885	10,501	3,479	25,628	44,041	72,966
British Columbia	104	2,439	11,910	3,093	34,240	44,503	81,645
Canada	1,080	50,879	253,483	56,047	666,728	824,592	1,543,884

Table 3 (Cont'd)

	Establish-ments No.	Employees No.	Salaries & Wages $'000	Cost of Fuel & Electricity $'000	Cost of Materials Used $'000	Value Added by Manufacture $'000	Selling Value of Factory Shipments $'000
1963(c)							
Newfoundland & P.E.I.	4	134	529	35	2,622	1,733	4,383
Nova Scotia	14	252	1,132	136	3,399	2,951	6,468
New Brunswick	10	216	908	116	3,967	1,506	5,583
Quebec	342	20,790	107,155	13,557	179,114	254,577	445,648
Ontario	534	34,925	190,356	38,565	453,707	508,598	997,670
Manitoba	34	744	3,170	162	9,044	8,602	17,751
Saskatchewan	9	90	442	21	1,142	1,271	2,428
Alberta	41	2,086	12,010	3,980	29,630	47,746	81,058
British Columbia	105	2,917	14,470	3,326	37,078	43,663	83,797
Canada	1,093	62,154	330,173	59,897	719,704	870,647	1,644,786
1964(c)							
Newfoundland & P.E.I.	7	138	588	42	3,025	1,467	4,534
Nova Scotia	15	252	1,130	117	3,309	2,861	6,287
New Brunswick	11	267	1,236	507	5,436	3,324	9,267
Quebec	346	21,174	113,650	14,554	205,366	276,635	496,555
Ontario	564	35,966	201,894	40,017	494,258	548,926	1,083,201
Manitoba	37	805	3,574	190	10,733	9,264	20,187
Saskatchewan	12	171	894	125	2,610	860	3,595
Alberta	38	2,088	12,478	4,187	31,290	49,334	84,811
British Columbia	110	2,983	15,404	3,937	41,788	43,788	89,513
Canada	1,140	63,844	350,848	63,677	797,816	936,458	1,797,951

Table 3 (Cont'd)

	Establish-ments No.	Employees No.	Salaries & Wages $'000	Cost of Fuel & Electricity $'000	Cost of Materials Used $'000	Value Added by Manufacture $'000	Selling Value of Factory Shipments $'000
1965(c) (Preliminary)							
Newfoundland & P.E.I.	6	138	617	46	3,352	1,616	5,014
Nova Scotia	15	257	1,225	181	3,427	2,904	6,512
New Brunswick	12	279	1,289	528	5,743	4,113	10,384
Quebec	337	21,729	119,478	15,545	215,705	276,117	507,367
Ontario	545	36,874	214,701	43,663	546,488	600,014	1,190,165
Manitoba	34	742	3,340	213	11,969	10,388	22,570
Saskatchewan	12	190	954	266	3,542	1,094	4,902
Alberta	37	2,334	14,193	4,810	35,427	48,553	88,790
British Columbia	104	3,001	16,745	4,301	41,814	37,116	83,231
Canada	1,102	65,544	372,543	69,553	867,467	981,915	1,918,935

(a) Prior to 1960, The Chemical and Allied Products Industries; data for 1929 and 1939 were not revised and differ slightly from those for the industry breakdown

(b) From 1960-1965 based on the revised Standard Industrial Classification (1960) and the new Establishment Concept (1961)

(c) Value added estimated

Source: D.B.S., Cat. Nos. 46-201 and 46-217

Table 4

PERCENTAGE DISTRIBUTION OF PRINCIPAL STATISTICS FOR THE CHEMICAL AND CHEMICAL PRODUCTS INDUSTRIES BY REGIONS, SELECTED YEARS, 1939 TO 1965

	Establishments %	Employees %	Salaries & Wages %	Value Added by Manufacture %	Selling Value of Factory Shipments %
1939					
Atlantic Region	2.6	2.2	1.9	2.2	3.0
Quebec	31.1	36.7	34.5	30.5	30.6
Ontario	52.5	51.9	54.0	57.6	56.4
Prairie Region	7.7	3.5	3.1	3.2	3.3
British Columbia	6.2	5.8	6.5	6.5	6.6
Canada	100.0	100.0	100.0	100.0	100.0
1949					
Atlantic Region	3.1	1.4	1.3	1.4	2.1
Quebec	32.2	37.5	36.1	29.9	28.5
Ontario	51.2	51.2	52.3	55.0	56.3
Prairie Region	7.0	3.8	3.7	4.3	4.8
British Columbia	6.5	6.0	6.6	9.5	8.3
Canada	100.0	100.0	100.0	100.0	100.0
1955					
Atlantic Region	2.7	1.0	0.8	0.9	1.2
Quebec	32.9	41.0	39.9	31.5	32.0
Ontario	49.1	48.5	49.0	55.1	55.4
Prairie Region	7.0	4.7	5.1	5.2	5.0
British Columbia	8.3	4.8	5.1	7.3	6.4
Canada	100.0	100.0	100.0	100.0	100.0
1961					
Atlantic Region	2.4	0.9	0.7	0.8	1.1
Quebec	31.7	35.9	35.3	29.6	28.3
Ontario	49.3	53.3	54.2	58.5	60.1
Prairie Region	7.3	5.1	5.1	5.8	5.5
British Columbia	9.3	4.8	4.7	5.3	5.0
Canada	100.0	100.0	100.0	100.0	100.0

Table 4 (Cont'd)

	Establish-ments	Employees	Salaries & Wages	Value Added by Manu-facture	Selling Value of Factory Shipments
	%	%	%	%	%
1963					
Atlantic Region	2.6	1.0	0.8	0.7	1.0
Quebec	31.3	33.4	32.5	29.2	27.1
Ontario	48.9	56.2	57.7	58.4	60.7
Prairie Region	7.7	4.7	4.7	6.6	6.2
British Columbia	9.6	4.7	4.4	5.0	5.1
Canada	100.0	100.0	100.0	100.0	100.0
1965					
Atlantic Region	3.0	1.0	0.8	0.9	1.1
Quebec	30.6	33.2	32.1	28.1	26.4
Ontario	49.5	56.3	57.6	61.1	62.0
Prairie Region	7.5	5.0	5.0	6.1	6.1
British Columbia	9.4	4.6	4.5	3.8	4.3
Canada	100.0	100.0	100.0	100.0	100.0

Source: Based on D.B.S. data

Table 5

PRODUCTS SHIPPED BY THE CHEMICAL AND CHEMICAL PRODUCTS INDUSTRIES - 1960

	Value $'000	% of Total
Sulphuric acid	18,215	1.3
Adhesives (excluding urea-formaldehyde and phenol-formaldehyde resin solutions)	13,483	1.0
Ammonia, anhydrous, 100%	8,774	0.6
Anti-freeze preparations	11,822	0.9
Chlorine	10,758	0.8
Cleaning preparations and washing compounds	30,034	2.2
Detergents	64,916	4.7
Mixed fertilizers	42,267	3.1
Ammonium nitrate (fertilizer grade)	15,955	1.2
Acetylene (compressed and liquefied)	7,849	0.6
Oxygen	12,332	0.9
Inks, printing and writing	16,626	1.2
Medicinals and pharmaceuticals	158,638	11.6
Paint and paint products	139,355	10.1
Pest control products	14,738	1.1
Pigments, lakes and toners	23,955	1.7
Pitch	5,174	0.4
Polishes	21,119	1.5
Resins (excludes: casein, cellulose acetate, epoxy, melamine, polyethylene)	87,330	6.4
Rubber, synthetic	76,039	5.5
Soaps	32,957	2.4
Sodium hydroxide (caustic soda)	14,597	1.1
Toilet preparations	79,451	5.8
Amount received in payment for work done on materials owned by others	1,940	0.1
All other products	465,142	33.9
Total	1,373,467	100.0

Source: D.B.S., Cat. No. 46-201, 1960

Table 6

MATERIALS USED BY THE CHEMICAL AND CHEMICAL PRODUCTS INDUSTRIES - 1960

	Value $'000	% of Total
Acids	12,631	2.2
Alcohol	6,117	1.0
Ammonia	7,831	1.3
Benzene (benzol)	6,659	1.1
Coal & coke	5,697	1.0
Oils	18,662	3.2
Petrochemical feed stock	32,217	5.5
Phosphate rock	11,569	2.0
Pigments	9,828	1.7
Resins and gums	18,030	3.1
Sodium chloride	5,161	0.9
Sodium tripolyphosphate	7,065	1.2
Solvents, n.e.s.	5,408	0.9
Sulphur	6,058	1.0
Superphosphate	11,153	1.9
Titanium dioxide	11,734	2.0
Containers and other packaging materials	84,763	14.5
Operating, maintenance and repair supplies, not including fuel	38,211	6.6
Amount paid out to others for work done on own materials	4,473	0.8
All other materials	279,575	48.0
Total	582,843	100.0

Source: D.B.S., Cat. No. 46-201, 1960

Table 7

IMPORTS AND EXPORTS OF CHEMICALS AND CHEMICAL PRODUCTS, SELECTED YEARS, 1929 TO 1966

Year	Canada	From or to United Kingdom		From or to United States	
	$'000	$'000	%	$'000	%
		A. Imports			
1929	40,131	5,502	13.7	27,404	68.3
1939	43,706	7,375	16.9	30,668	70.2
1949	130,660	8,448	6.5	115,033	88.0
1950	158,221	14,047	8.9	134,603	85.1
1951	191,813	16,188	8.4	165,061	86.1
1952	187,713	12,225	6.5	166,249	88.6
1953	221,834	18,551	8.4	191,812	86.5
1954	220,406	18,590	8.4	190,489	86.4
1955	260,499	22,626	8.7	222,612	85.5
1956	288,586	22,639	7.8	250,365	86.8
1957(a)	327,599	23,568	7.1	282,233	86.2
1958	321,042	23,737	7.4	275,086	85.7
1959	354,960	26,452	7.5	301,417	84.9
1960	369,933	25,084	6.8	311,178	84.1
1961	404,200	29,637	7.3	337,076	83.4
1962	427,674	35,599	8.3	351,049	82.1
1963	446,832	33,061	7.4	369,621	82.7
1964	451,415	32,250	7.1	375,365	83.2
1965	519,630	34,365	6.6	430,288	82.8
1966	549,794	32,271	5.9	452,285	82.3
		B. Exports			
1929	21,828	4,730	21.7	11,986	54.9
1939	24,263	5,731	23.6	9,684	39.9
1949	70,698	5,546	7.8	33,359	47.2
1950	100,525	5,993	6.0	58,499	58.2
1951	131,690	10,370	7.9	67,253	51.1
1952	124,565	9,712	7.8	75,107	60.3
1953	137,885	8,551	6.2	84,599	61.4
1954	153,238	15,676	10.2	77,855	50.8
1955	183,507	19,945	10.9	85,191	46.4
1956	182,854	21,283	11.6	84,975	46.5
1957(a)	200,224	31,527	15.7	81,826	40.9
1958	195,466	34,588	17.7	82,569	42.2
1959	206,199	30,003	14.6	91,386	44.3
1960	245,243	37,729	15.4	99,108	40.4
1961	249,796	36,570	14.6	106,530	42.6
1962	250,489	31,631	12.6	128,575	51.3
1963	278,929	34,611	12.4	137,396	49.3
1964	322,686	48,615	15.1	142,340	44.1
1965	357,540	45,028	12.6	187,616	52.5
1966	405,250	43,504	10.7	229,102	56.5

(a) Data for 1957 and following years are converted approximately to a Reference 120 basis

Source: D.B.S., Trade of Canada

Table 8

VALUE ADDED PER EMPLOYEE IN THE CHEMICAL INDUSTRIES, SELECTED YEARS, 1929 TO 1965

Chemicals and Allied Products Group

	1929 $	1939 $	1949 $	1959 $
Acids, Alkalies and Salts	6,489	4,631	6,767	13,625
Fertilizers	3,151	3,566	10,396	13,573
Medicinals and Pharmaceutical Preparations	4,432	3,915	6,269	14,360
Paints, Pigments and Varnishes	5,029	3,797	6,597	11,722
Primary Plastics	..	..	7,515	12,620
Soaps, Washing Compounds and Cleaning Preparations	4,286	4,404	8,360	19,092
Toilet Preparations	4,957	3,611	6,910	13,445
Vegetable Oils	3,598	4,163	11,017	15,864
Inks	4,875	3,587	6,923	10,112
Adhesives	2,996	2,614	4,360	10,822
Polishes and Dressings	3,315	3,972	7,364	16,675
Compressed Gases	5,583	4,988	7,915	14,358
Coal Tar Distillation	4,281	4,556	9,631	9,878
Miscellaneous Chemical Products	3,274	3,584	5,309	8,928
Total - Chemicals and Allied Products Group	4,704	3,947	6,973	12,805

Chemical and Chemical Products Group

	1959 $	1961 $	1963 $	1965 $
Explosives and Ammunition	6,512	6,838	8,956	10,230
Mixed Fertilizers	11,210	10,469	11,632	8,412
Plastics and Synthetic Resins	12,476	14,467	17,689	15,516
Pharmaceuticals and Medicines	13,946	15,352	13,372	14,091
Paints and Varnishes	11,821	13,244	11,357	11,928
Soaps and Cleaning Compounds	20,180	20,986	15,615	17,381
Toilet Preparations	13,821	17,217	14,325	15,623
Industrial Chemicals	13,612	16,067	16,500	17,703
Printing Inks	10,502	10,887	9,344	10,139
Other Chemicals	11,563	13,320	11,993	14,649
Total - Chemical and Chemical Products Group	12,784	14,586	14,008	14,981

Source: Based on D.B.S. data

Table 9

FACTORY SHIPMENTS BY MANUFACTURING INDUSTRIES, SELECTED YEARS, 1939 TO 1965

Industry	Factory Shipments							
	1939	1949	1955	1959	1960	1963	1964	1965
	- million dollars -							
Chemical and Chemical Products	160	587	1,044	1,378	1,373	1,645	1,798	1,922
Electrical Products Industries	89	486	963	1,047	1,176	1,545	1,704	1,877
Food and Beverage Industries	638	2,883	3,614	4,674	4,880	5,714	6,127	6,455
Metal Fabricating Industries	208	867	1,627	1,740	1,433	1,877	2,137	2,346
Paper and Allied Industries	240	1,093	1,754	2,027	2,128	2,452	2,707	2,858
Petroleum and Coal Products Industries	144	534	1,161	1,268	1,198	1,366	1,419	1,445
Primary Metal Industries	554	1,419	2,243	3,078	2,743	2,221	2,547	2,823
Printing, Publishing and Allied Industries	100	378	620	824	866	928	984	1,006
Textile Industries	394	637	735	803	811	1,100	1,205	1,275
Transportation Equipment Industries	208	1,063	1,950	2,022	2,001	2,818	3,198	3,954
Wood Industries	240	840	1,375	1,425	1,068	1,277	1,396	1,487
Other Manufacturing Industries	500	1,693	2,428	3,026	4,070	5,072	5,635	5,881
All Manufacturing	3,475	12,480	19,514	23,312	23,747	28,015	30,857	33,619

Source: D.B.S., various publications

Table 10

PERCENTAGE DISTRIBUTION OF FACTORY SHIPMENTS BY MANUFACTURING INDUSTRIES, SELECTED YEARS, 1939 TO 1965

Industry	1939	1949	1955	1959	1960	1963	1964	1965
				- per cent -				
Chemical and Chemical Products	4.6	4.7	5.4	5.9	5.8	5.9	5.8	5.7
Electrical Products Industries	2.6	3.9	4.9	4.5	5.0	5.5	5.5	5.6
Food and Beverage Industries	18.4	23.1	18.5	20.0	20.5	20.4	19.9	19.2
Metal Fabricating Industries	6.0	6.9	8.3	7.5	6.0	6.7	6.9	7.0
Paper and Allied Industries	6.9	8.8	9.0	8.7	9.0	8.8	8.8	8.5
Petroleum and Coal Products Industries	4.1	4.3	5.9	5.4	5.0	4.9	4.6	4.3
Primary Metal Industries	15.9	11.4	11.5	13.2	11.6	7.9	8.3	8.4
Printing, Publishing and Allied Industries	2.9	3.0	3.2	3.5	3.6	3.3	3.2	3.0
Textile Industries	11.3	5.1	3.8	3.4	3.4	3.9	3.9	3.8
Transportation Equipment Industries	6.0	8.5	10.0	8.7	8.4	10.1	10.4	11.8
Wood Industries	6.9	6.7	7.0	6.1	4.5	4.6	4.5	4.4
Other Manufacturing Industries	14.4	13.6	12.4	13.0	17.1	18.1	18.3	18.2
All Manufacturing	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Based on D.B.S. data

Table 11

VALUE ADDED BY MANUFACTURING INDUSTRIES,
SELECTED YEARS, 1939 TO 1963

Industry	1939	1949	1955	1959	1960	1961	1962	1963
				- million dollars -				
Chemical and Chemical Products	89	288	529	701	748	764	825	871
Electrical Products	..	269	470	566	625	619	735	785
Food and Beverage Industries	..	834	1,258	1,613	1,705	1,709	1,818	1,898
Metal Fabricating	156	289	591	601	751	755	855	919
Paper and Allied Industries	..	532	867	981	1,036	1,070	1,131	1,181
Petroleum and Coal Products	..	118	417	279	280	290	283	285
Primary Metal Industries	276	761	1,199	1,568	1,047	1,115	1,209	1,252
Printing, Publishing and Allied Industries	..	250	416	553	586	599	627	647
Textiles	182	286	315	364	369	390	440	489
Transportation Equipment	..	467	810	911	872	772	949	1,136
Wood Industries	304	394	632	645	455	436	510	572
All Other Industries	524	843	1,249	1,539	2,059	2,171	2,359	2,533
All Manufacturing	1,531	5,331	8,753	10,321	10,533	10,690	11,741	12,568

Source: D.B.S., various publications

Table 12

PERCENTAGE DISTRIBUTION OF VALUE ADDED BY MANUFACTURING INDUSTRIES, SELECTED YEARS, 1939 TO 1963

Industry	1939	1949	1955	1959	1960	1961	1962	1963
				- per cent -				
Chemical and Chemical Products	5.8	5.4	6.0	6.8	7.1	7.1	7.0	6.9
Electrical Products	..	5.0	5.4	5.5	5.9	5.8	6.3	6.2
Food and Beverage Industries	..	15.6	14.4	15.6	16.2	16.0	15.5	15.1
Metal Fabricating	10.2	5.4	6.8	5.8	7.1	7.1	7.3	7.3
Paper and Allied Industries	..	10.0	9.9	9.5	9.8	10.0	9.6	9.4
Petroleum and Coal Products	..	2.2	4.8	2.7	2.7	2.7	2.4	2.3
Primary Metal Industries	18.0	14.3	13.7	15.2	9.9	10.4	10.3	10.0
Printing, Publishing and Allied Industries	..	4.7	4.7	5.4	5.6	5.6	5.3	5.1
Textiles	11.9	5.4	3.6	3.5	3.5	3.6	3.7	3.9
Transportation Equipment	..	8.8	9.3	8.8	8.3	7.2	8.1	9.0
Wood Industries	19.9	7.4	7.2	6.2	4.3	4.1	4.3	4.6
All Other Industries	34.2	15.8	14.3	14.9	19.5	20.3	20.1	20.2
All Manufacturing	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Based on D.B.S. various publications

Table 13

VALUE ADDED PER EMPLOYEE, MANUFACTURING INDUSTRIES, SELECTED YEARS, 1939 TO 1963

Industry	1939	1949	1955	1959	1960	1961	1962	1963
				- dollars -				
Chemical and Chemical Products	3,939	6,969	9,694	12,796	13,783	12,059	12,910	13,299
Electrical Products	..	4,811	6,271	7,661	7,947	6,927	7,609	7,753
Food and Beverage	..	4,905	6,606	8,397	8,585	8,134	8,603	9,035
Metal Fabricating	3,501	6,466	11,520	11,552	7,624	7,471	7,810	8,117
Paper and Allied Products	..	6,957	9,329	10,411	10,856	10,850	11,230	11,589
Petroleum and Coal Products	..	8,109	23,928	16,632	19,293	17,692	17,386	18,508
Primary Metal	2,280	4,651	6,682	8,126	11,630	12,409	13,152	13,286
Printing, Publishing and Allied Products	..	4,043	5,760	7,480	7,952	7,850	8,294	8,492
Textiles	1,504	3,677	4,963	5,725	5,975	6,021	6,489	6,952
Transportation Equipment	..	4,458	6,430	8,019	7,970	7,776	9,051	10,177
Wood Products	2,100	3,239	5,227	5,210	5,336	5,311	6,110	6,583
All Other Manufacturing	2,567	3,533	5,078	6,100	6,156	5,995	6,364	6,657
All Manufacturing	2,326	4,552	6,787	7,915	8,136	7,899	8,438	8,806

Source: D.B.S., Cat. Nos. 31-201, 31-203

Table 14

CAPITAL AND REPAIR EXPENDITURES BY THE CHEMICAL AND CHEMICAL PRODUCTS INDUSTRIES, AND ALL MANUFACTURING, 1946 TO 1966

Year	Chemical & Chemical Products: Construction	Machinery & Equipment	Total	All Manufacturing Total	Chemicals As Per Cent of All Manufacturing
	- million dollars -				%
1946	14.5	18.3	32.8	558.3	5.9
1947	18.4	31.8	50.2	801.2	6.3
1948	19.3	42.7	62.0	901.8	6.9
1949	15.8	43.2	59.0	874.6	6.7
1950	11.6	38.1	49.7	849.1	5.9
1951	23.2	63.3	86.5	1,215.1	7.1
1952	65.7	106.4	172.1	1,431.3	12.0
1953	36.3	116.8	153.1	1,448.9	10.6
1954	21.3	56.1	77.4	1,310.6	5.9
1955	26.3	64.8	91.1	1,459.7	6.2
1956	64.1	118.9	183.0	1,971.6	9.3
1957	73.7	123.7	197.4	2,092.8	9.4
1958	52.3	115.4	167.7	1,666.9	10.1
1959	34.6	101.5	136.1	1,806.3	7.5
1960	45.7	120.3	166.0	1,849.0	9.0
1961	45.8	140.0	185.8	1,766.7	10.5
1962	50.1	109.3	159.4	2,019.7	7.9
1963	51.4	133.1	184.5	2,157.5	8.6
1964	55.5	161.1	216.6	2,726.6	7.9
1965	89.5	268.5	358.0	3,313.9	10.8
1966(a)	89.7	273.0	362.7	3,831.0	9.5

(a) Preliminary

Source: D.B.S. and Department of Trade and Commerce, Private and Public Investment in Canada, Cat. No. 61-205

Table 15

CAPITAL AND REPAIR EXPENDITURES BY THE CHEMICAL AND CHEMICAL PRODUCTS INDUSTRIES, BY GEOGRAPHICAL AREA, 1962 TO 1966

	1962	1963	1964	1965	1966[a]
		- million dollars -			
Atlantic Provinces[b]	2.4	3.1	5.8	21.3	30.1
Quebec	53.5	45.0	42.2	54.5	77.3
Ontario	85.9	102.2	107.0	199.7	182.8
Manitoba & Sask.	2.0	7.6	7.3	9.6)	58.6
Alberta	7.0	9.4	30.8	47.6)	
British Columbia	8.6	17.2	23.5	25.3	13.9
Total - Canada	159.4	184.5	216.6	358.0	362.7

(a) Preliminary
(b) Estimated residually

Source: D.B.S. and Dept. of Trade and Commerce, Private and Public Investment in Canada, Cat. No. 61-205

Table 16

CAPITAL AND REPAIR EXPENDITURES, BY PRINCIPAL CHEMICAL INDUSTRIES, 1960 TO 1966

	1960	1961	1962	1963	1964	1965	1966[a]
			- million dollars -				
Mixed Fertilizers	5.8	4.8	4.9	4.2	9.8	39.9	39.0
Plastics and Resins	11.6	15.6	(b)	18.9	20.5	21.9	32.2
Paint and Varnish	3.4	2.8	3.4	4.1	5.2	13.4	7.9
Industrial Chemicals	108.3	124.3	99.7	122.2	141.8	226.6	207.5
Plastics Fabricators	8.1	7.3	9.1	11.0	12.5	16.6	16.2
Other Chemical Industries	23.3	26.6	37.8[c]	17.2	19.1	34.2	46.6
Sub-total of above	160.5	181.4	154.9	177.6	208.9	352.6	349.4
Pharmaceuticals and Medicines	9.0	7.8	7.6	9.8	10.5	13.8	21.0
Soaps, Toilet Preparations and Cleaning Compounds	4.8	4.3	5.0	5.3	8.1	8.5	8.8
Total	174.3	193.5	167.5	192.7	227.5	374.9	379.2

(a) Preliminary
(b) Included in "Other Chemical Industries"
(c) Includes "Plastics & Synthetic Resins" and "Explosives & Ammunition"

Source: Based on D.B.S. data

Table 17

PERCENTAGE DISTRIBUTION OF CAPITAL AND REPAIR EXPENDITURES, BY PRINCIPAL CHEMICAL INDUSTRIES, 1960 TO 1966

	1960	1961	1962	1963	1964	1965	1966[a]
	- per cent -						
Mixed Fertilizers	3.3	2.5	2.9	2.2	4.3	10.6	10.3
Plastics and Resins	6.7	8.1	(b)	9.8	9.0	5.8	8.5
Paint and Varnish	2.0	1.4	2.0	2.1	2.3	3.6	2.1
Industrial Chemicals	62.1	64.2	59.5	63.4	62.3	60.4	54.7
Plastics Fabricators	4.6	3.8	5.4	5.7	5.5	4.4	4.3
Other Chemical Industries	13.4	13.7	22.6[c]	8.9	8.4	9.1	12.3
Sub-total of above	92.1	93.7	92.5	92.2	91.8	94.1	92.1
Pharmaceuticals and Medicines	5.2	4.0	4.5	5.1	4.6	3.7	5.5
Soaps, Toilet Preparations and Cleaning Compounds	2.8	2.2	3.0	2.8	3.6	2.3	2.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

(a) Preliminary
(b) Included in "Other Chemical Industries"
(c) Includes "Plastics & Synthetic Resins" and "Explosives and Ammunition"

Source: Based on D.B.S. data

Table 18

CAPITAL AND REPAIR EXPENDITURES, BY MANUFACTURING INDUSTRIES, SELECTED YEARS, 1949 TO 1966

Industry Group	1949	1955	1959	1960	1963	1964	1965	1966 (a)	Total 1949-66	Average 1949-66
					- million dollars -					
Chemical and Chemical Products	59.0	91.1	136.1	166.0	184.5	216.6	358.0	362.7	3,006.1	167.0
Electrical Products	28.0	44.5	48.9	51.9	67.5	77.0	98.4	140.4	1,067.2	59.3
Food and Beverages	119.8	160.0	202.3	221.8	244.7	271.4	295.7	308.5	3,519.7	195.5
Metal Fabricating	60.5	135.7	124.5	77.3	88.4	111.8	152.2	162.9	2,083.8	115.8
Paper and Allied Industries	141.3	222.9	230.3	269.4	326.1	454.1	565.2	718.7	5,334.3	296.4
Petroleum and Coal Products	41.8	136.3	154.6	89.7	81.8	62.6	77.1	107.0	1,817.2	101.0
Primary Metals	103.6	183.5	303.4	359.3	363.8	485.2	497.9	642.3	5,249.2	291.6
Printing, Publishing and Allied Industries	25.4	30.7	48.9	38.2	55.9	67.9	63.6	61.1	738.1	41.0
Textile	50.6	47.5	42.7	48.1	77.4	122.9	140.4	132.4	1,188.7	66.0
Transportation Equipment	47.5	93.1	109.4	89.7	134.5	192.0	284.1	308.1	2,228.4	123.8
Wood	50.6	79.9	87.2	75.6	93.8	110.3	132.1	115.3	1,443.5	80.2
Other Industries	146.5	234.5	318.0	362.0	439.1	554.8	649.2	771.6	6,115.1	339.7
All Manufacturing	874.6	1,459.7	1,806.3	1,849.0	2,157.5	2,726.6	3,313.9	3,831.0	33,791.3	1,877.3

(a) Preliminary

Source: D.B.S. and Department of Trade and Commerce, Private and Public Investment in Canada, Cat. No. 61-205

Table 19

PERCENTAGE DISTRIBUTION OF CAPITAL AND REPAIR EXPENDITURES BY MANUFACTURING INDUSTRIES, SELECTED YEARS, 1949 TO 1966

Industry Group	1949	1955	1959	1960	1963	1964	1965	1966 (a)	Total as % of All Mfg. 1949-66
				- per cent -					
Chemical and Chemical Products	6.7	6.2	7.5	9.0	8.6	7.9	10.8	9.5	8.9
Electrical Products	3.2	3.0	2.7	2.8	3.1	2.8	3.0	3.7	3.2
Food and Beverages	13.7	11.0	11.2	12.0	11.3	10.0	8.9	8.1	10.4
Metal Fabricating	6.9	9.3	6.9	4.2	4.1	4.1	4.6	4.3	6.2
Paper and Allied Industries	16.2	15.3	12.7	14.6	15.1	16.7	17.1	18.8	15.8
Petroleum and Coal Products	4.8	9.3	8.6	4.9	3.8	2.3	2.3	2.8	5.4
Primary Metals	11.8	12.6	16.8	19.4	16.9	17.8	15.0	16.8	15.5
Printing, Publishing and Allied Industries	2.9	2.1	2.7	2.1	2.6	2.5	1.9	1.6	2.2
Textile	5.8	3.3	2.4	2.6	3.6	4.5	4.2	3.5	3.5
Transportation Equipment	5.4	6.4	6.1	4.9	6.2	7.0	8.6	8.0	6.6
Wood	5.8	5.5	4.8	4.1	4.3	4.0	4.0	3.0	4.3
Other Industries	16.8	16.1	17.6	19.6	20.4	20.4	19.6	20.1	18.1
All Manufacturing	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

(a) Preliminary

Source: Based on D.B.S. and Department of Trade and Commerce data

Table 20

INDEX OF PRODUCTION FOR MANUFACTURING AND SELECTED MANUFACTURING INDUSTRIES, SELECTED YEARS, 1955 TO 1965

1949 = 100

Industry	1955	1959	1960	1961	1962	1963	1964	1965
Chemical Products	175.3	228.7	245.5	250.3	262.9	282.5	312.7	344.7
Electrical Apparatus and Supplies	174.9	190.6	190.4	197.9	236.5	254.9	279.1	319.2
Food and Beverages	125.7	152.3	153.9	159.1	167.3	172.2	185.6	193.1
Iron and Steel Products	130.7	155.9	151.5	156.6	174.5	191.0	215.2	239.1
Miscellaneous Manufacturing	185.4	248.8	265.9	292.3	302.0	353.0	386.5	407.3
Paper Products	127.2	143.4	150.9	156.7	163.7	170.1	186.3	198.3
Petroleum and Coal Products	190.3	251.9	263.4	274.0	291.1	318.0	330.1	345.9
Printing, Publishing and Allied Industries	142.3	169.6	176.2	180.4	189.5	195.2	207.4	223.3
Textiles	120.0	137.0	138.9	152.1	167.7	186.0	203.3	220.6
Transportation Equipment	147.7	135.7	136.9	138.1	165.3	190.2	210.5	250.0
Wood Products	139.5	143.4	143.6	144.9	158.6	167.3	174.3	181.7
All Manufacturing	138.3	159.0	161.2	166.9	181.2	193.9	211.9	230.1

Source: D.B.S., Cat. No. 61-005

Table 21

INDEX OF EMPLOYMENT FOR SELECTED MANUFACTURING INDUSTRIES, SELECTED YEARS, 1939 TO 1965

1949 = 100

Industry	1939	1955	1959	1963	1964	1965	1965 Employees ('000)
Chemical Products	47.6	122.2	129.4	135.4	139.7	147.5	62
Electrical Apparatus and Supplies	37.4	137.4	135.8	154.7	160.9	173.2	95
Food and Beverages	63.3	106.9	114.6	116.7	119.0	122.7	173
Iron and Steel Products	45.6	102.9	109.7	114.4	122.0	133.1	216
Miscellaneous Manufacturing Industries	50.2	102.8	126.5	152.9	163.3	168.7	44
Paper Products	58.8	118.2	123.2	127.4	132.2	138.1	104
Petroleum and Coal Products	65.6	125.6	138.5	139.9	142.2	140.3	16
Printing, Publishing and Allied Industries	66.1	111.8	121.3	126.2	126.1	131.3	63
Textile Products (except clothing)	67.9	85.4	78.8	85.1	90.3	92.8	69
Transportation Equipment	45.9	131.2	112.3	115.5	126.8	138.3	155
Wood Products	60.7	107.3	103.5	110.9	115.3	119.9	112
All Manufacturing	56.3	109.8	111.1	116.4	121.9	128.3	1,387

Source: D.B.S., Cat. Nos. 72-201 and 72-002

Table 22

CORPORATION SALES AND PROFITS BEFORE AND AFTER TAXES, BY MANUFACTURING INDUSTRIES, 1961 AND 1965

Industry	1961 Sales	1961 Profits Before Taxes	1961 Profits After Taxes	1961 Profits as p.c. of Sales Before Taxes	1961 Profits as p.c. of Sales After Taxes	1965 Sales	1965 Profits Before Taxes	1965 Profits After Taxes	1965 Profits as p.c. of Sales Before Taxes	1965 Profits as p.c. of Sales After Taxes
	- million dollars -			- per cent -		- million dollars -			- per cent -	
Chemical and Chemical Products	1,582	110	52	7.0	3.3	2,411	220	125	9.1	5.2
Electrical Products	1,401	41	18	2.9	1.3	2,237	111	64	5.0	2.9
Food and Beverage	5,176	263	129	5.1	2.5	6,379	370	204	5.8	3.2
Metal Fabricating	1,690	77	42	4.6	2.5	2,672	150	82	5.6	3.1
Paper and Allied Products	2,127	255	128	12.0	6.0	2,653	235	111	8.9	4.2
Petroleum and Coal Products	1,692	109	53	6.4	3.1	2,873	131	85	4.6	3.0
Primary Metal	1,850	159	96	8.6	5.2	2,792	234	151	8.4	5.4
Printing, Publishing and Allied Industries	880	57	29	6.5	3.3	1,132	88	49	7.8	4.3
Textile Industries	1,861	67	39	3.6	2.1	2,563	86	58	3.4	2.3
Transportation Equipment	2,009	127	70	6.3	3.5	4,476	234	131	5.2	2.9
Wood Industries	1,710	72	32	4.2	1.9	2,131	119	67	5.6	3.1
Other Manufacturing	4,034	218	112	5.4	2.8	5,536	393	228	7.1	4.1
All Manufacturing	26,012	1,555	800	6.0	3.1	37,855	2,371	1,355	6.3	3.6

Source: D.B.S., Corporation Profits, Cat. No. 61-003 (Fourth Quarter)

Table 23

CORPORATION PROFITS BEFORE AND AFTER TAXES, BY MANUFACTURING INDUSTRIES, SELECTED YEARS, 1961 TO 1966

Industry	1961 Before Taxes	1961 After Taxes	1963 Before Taxes	1963 After Taxes	1964 Before Taxes	1964 After Taxes	1965 Before Taxes	1965 After Taxes	1966 Before Taxes	1966 After Taxes
				- million dollars -						
Chemical and Chemical Products Industries	110	52	186	103	211	120	220	125	231	129
Electrical Products Industries	41	18	75	41	97	52	111	64	117	61
Food and Beverage Industries	263	129	311	167	343	189	370	204	366	198
Metal Fabricating Industries	77	42	99	54	123	70	150	82	163	84
Paper and Allied Industries	255	128	250	113	276	137	235	111	180	76
Petroleum and Coal Products Industries	109	53	103	50	118	75	131	85	164	101
Primary Metal Industries	159	96	168	104	179	114	234	151	188	134
Printing, Publishing and Allied Industries	57	29	60	31	78	43	88	49	95	51
Textile Industries	67	39	92	60	87	55	86	58	65	45
Transportation Equipment Industries	127	70	259	148	219	127	234	131	190	116
Wood Industries	72	32	130	73	139	77	119	67	128	66
Other Manufacturing Industries	218	112	312	173	353	200	393	228	426	252
All Manufacturing	1,555	800	2,045	1,117	2,223	1,259	2,371	1,355	2,313	1,313

Source: D.B.S., Corporation Profits, Cat. No. 61-003 (Fourth Quarter)

Table 24

FINANCIAL STATISTICS OF CHEMICAL INDUSTRIES
1956 TO 1963

Chemicals and Allied Products Industries	1956	1957	1958	1959	1960	1961	1962	1963
			-	million dollars		-		
Current assets[a]	385.6	426.6	418.5	443.4	478.7	539.8	619.7	685.6
Fixed assets	721.3	842.7	930.1	984.0	1,145.0	1,272.5	1,429.8	1,601.0
Other assets[a]	34.3	35.4	37.6	43.7	47.9	44.3	59.0	60.2
Total assets before depreciation[a]	1,141.2	1,304.7	1,386.2	1,471.1	1,671.6	1,856.6	2,108.5	2,346.8
Less: accumulated depreciation	290.1	326.2	365.7	404.3	477.3	554.7	639.6	734.4
Total assets after depreciation[a]	851.1	978.5	1,020.5	1,066.8	1,194.3	1,301.9	1,468.9	1,612.4
Add: investments	96.4	184.7	173.3	140.9	231.3	319.2	353.8	358.1
	947.5	1,163.2	1,193.8	1,207.7	1,425.6	1,621.1	1,822.7	1,970.5
Less: liabilities	351.9	462.1	482.8	479.5	589.5	651.6	744.4	821.5
Net worth	595.6	701.1	711.0	728.2	836.1	969.5	1,078.3	1,149.0
Net sales	1,119.0	1,259.6	1,287.5	1,370.5	1,503.4	1,601.2	1,838.9	2,001.2
Less: cost of goods sold	622.7	768.2	840.1	884.9	935.1	1,043.5	1,191.8	1,283.9
Gross profit	496.3	491.4	447.4	485.6	568.3	557.7	647.1	717.3
Less: other expenses	400.4	401.7	356.8	366.4	455.8	447.2	501.6	551.0
Net profit before income tax[b]	95.9	89.7	90.6	119.2	112.5	110.5	145.5	166.3
Add: investment income	4.0	3.4	3.3	4.9	5.0	6.0	5.4	11.9
Less: Dominion income tax	40.8	35.8	37.0	49.6	48.4	49.0	61.3	68.3
Net profit after income tax	59.1	57.3	56.9	74.5	69.1	67.5	89.6	109.9
Number of profit companies	638	637	628	660	623	590	567	699
Number of loss companies	237	193	230	194	187	259	337	217

(a) Excluding investments
(b) Excluding investment income

Source: Based on data from Department of National Revenue, Taxation Statistics

Table 24 (Cont'd)

FINANCIAL STATISTICS OF CHEMICAL INDUSTRIES 1956 TO 1963

Paint and Varnish Industry	1956	1957	1958	1959	1960	1961	1962	1963
	-	million dollars	-					
Current assets(a)	50.9	48.1	51.6	50.5	61.7	66.6	56.2	56.6
Fixed assets	39.6	39.5	44.7	45.6	49.4	56.0	46.7	45.0
Other assets(a)	4.0	3.1	3.3	2.5	3.8	4.3	3.6	4.3
Total assets before depreciation(a)	94.5	90.7	99.6	98.6	114.9	126.9	106.5	105.9
Less: accumulated depreciation	19.3	18.4	19.5	22.0	25.5	29.6	25.5	26.0
Total assets after depreciation(a)	75.2	72.3	80.1	76.6	89.4	97.3	81.0	79.9
Add: investments	10.5	7.5	8.5	7.7	9.8	12.4	10.3	11.1
	85.7	79.8	88.6	84.3	99.2	109.7	91.3	91.0
Less: liabilities	32.0	32.6	40.2	33.1	45.2	42.3	36.1	37.1
Net worth	53.7	47.2	48.4	51.2	54.0	67.4	55.2	53.9
Net sales	122.1	116.7	121.7	122.6	151.7	156.5	142.2	138.3
Less: cost of goods sold	72.7	75.3	78.4	78.9	99.8	99.6	90.7	89.8
Gross profit	49.4	41.4	43.3	43.7	51.9	56.9	51.5	48.5
Less: other expenses	42.4	35.1	37.0	36.1	47.4	50.0	45.6	40.9
Net profit before income tax(b)	7.0	6.3	6.3	7.6	4.5	6.9	5.9	7.6
Add: investment income	-	-	-	0.8	0.7	1.6	0.1	0.4
Less: Dominion income tax	3.0	2.5	2.5	2.9	2.2	2.8	2.4	3.1
Net profit after income tax	4.0	3.8	3.8	5.5	3.0	5.7	3.6	4.9
Number of profit companies	92	77	76	95	88	102	99	92
Number of loss companies	23	13	25	..	15	39	48	10

(a) Excluding investments
(b) Excluding investment income

Source: Based on data from Department of National Revenue, Taxation Statistics

Table 24 (Cont'd)

FINANCIAL STATISTICS OF CHEMICAL INDUSTRIES
1956 TO 1963

Soap and Toilet Preparations	1956	1957	1958	1959	1960	1961	1962	1963
			- million dollars -					
Current assets[(a)]	58.3	54.4	54.6	58.6	56.6	62.3	69.9	88.9
Fixed assets	61.3	60.3	71.2	72.6	84.7	84.3	92.6	109.3
Other assets[(a)]	2.9	2.6	4.3	3.1	3.1	3.1	6.0	4.9
Total assets before depreciation[(a)]	122.5	117.3	130.1	134.3	144.4	149.7	168.5	203.1
Less: accumulated depreciation	25.0	24.6	30.2	31.6	34.8	36.3	41.5	51.5
Total assets after depreciation[(a)]	97.5	92.7	99.9	102.7	109.6	113.4	127.0	151.6
Add: investments	17.0	12.0	8.1	11.4	15.6	13.8	29.4	26.5
	114.5	104.7	108.0	114.1	125.2	127.2	156.4	178.1
Less: liabilities	34.7	34.3	30.7	33.2	38.7	38.6	51.1	67.1
Net worth	79.8	70.4	77.3	80.9	86.5	88.6	105.3	111.0
Net sales	184.9	176.7	203.5	190.5	216.6	235.9	276.6	300.4
Less: cost of goods sold	91.6	91.3	110.1	111.1	113.0	132.2	148.5	168.5
Gross profit	93.3	85.4	93.4	79.4	103.6	103.7	128.1	131.9
Less: other expenses	77.8	73.3	77.0	62.5	82.6	81.8	106.0	108.2
Net profit before income tax[(b)]	15.5	12.1	16.4	16.9	21.0	21.9	22.1	23.7
Add: investment income	0.6	0.5	0.4	0.5	0.7	0.8	1.7	2.2
Less: Dominion income tax	6.6	5.0	6.0	6.7	8.6	9.2	9.3	9.8
Net profit after income tax	9.5	7.6	10.8	10.7	13.1	13.5	14.5	16.1
Number of profit companies	123	129	115	98	103	90	120	121
Number of loss companies	61	23	30	50	30	39	20	44

(a) Excluding investments
(b) Excluding investment income

Source: Based on data from Department of National Revenue, Taxation Statistics

Table 24 (Cont'd)

FINANCIAL STATISTICS OF CHEMICAL INDUSTRIES
1956 TO 1963

Fertilizers and Industrial Chemicals	1956	1957	1958	1959	1960	1961	1962	1963
				- million dollars -				
Current assets(a)	67.3	76.7	58.6	66.2	96.9	105.7	141.8	165.0
Fixed assets	253.9	298.6	227.9	247.0	381.4	411.8	468.0	528.8
Other assets(a)	6.5	8.7	5.1	6.0	9.6	8.5	15.8	14.4
Total assets before depreciation(a)	327.7	384.0	291.6	319.2	487.9	526.0	625.6	708.2
Less: accumulated depreciation	87.1	99.9	74.0	89.1	159.8	187.6	202.1	233.0
Total assets after depreciation(a)	240.6	284.1	217.6	230.1	328.1	338.4	423.5	475.2
Add: investments	13.7	12.7	11.5	21.9	57.2	71.1	104.5	105.8
	254.3	296.8	229.1	252.0	385.3	409.5	528.0	581.0
Less: liabilities	109.6	140.1	118.1	121.7	178.6	179.6	214.5	257.6
Net worth	144.7	156.7	111.0	130.3	206.7	229.9	313.5	323.4
Net sales	218.5	268.8	191.1	223.7	293.0	314.7	386.5	411.3
Less: cost of goods sold	128.5	180.6	141.0	165.9	208.4	233.4	271.7	207.0
Gross profit	90.0	88.2	50.1	57.8	84.6	81.3	114.8	124.3
Less: other expenses	68.4	74.6	44.8	48.3	72.3	65.0	76.8	91.1
Net profit before income tax(b)	21.6	13.6	5.3	9.5	12.3	16.3	38.0	33.2
Add: investment income	1.1	0.8	0.9	0.7	2.1	1.5	1.3	0.9
Less: Dominion income tax	9.1	6.0	4.4	4.9	6.9	7.3	13.9	15.6
Net profit after income tax	13.6	8.4	1.8	5.3	7.5	10.5	25.4	18.5
Number of profit companies	39	64	59	68	112	58	81	81
Number of loss companies	27	6	5	14	22	30	40	35

(a) Excluding investments
(b) Excluding investment income

Source: Based on data from Department of National Revenue, Taxation Statistics

Table 24 (Cont'd)

FINANCIAL STATISTICS OF CHEMICAL INDUSTRIES
1956 TO 1963

Pharmaceutical Preparations	1956	1957	1958	1959	1960	1961	1962	1963
			- million dollars -					
Current assets(a)	62.3	70.1	70.6	82.4	79.3	86.4	82.0	92.8
Fixed assets	47.0	56.3	69.5	76.4	77.3	74.1	74.7	82.0
Other assets(a)	7.8	9.6	9.1	14.3	16.0	7.0	8.1	8.2
Total assets before depreciation(a)	117.1	136.0	149.2	173.1	172.6	167.5	164.8	183.0
Less: accumulated depreciation	19.0	23.3	26.6	27.1	27.9	28.7	29.5	30.4
Total assets after depreciation(a)	98.1	112.7	122.6	146.0	144.7	138.8	135.3	152.6
Add: investments	10.7	15.8	12.8	19.8	16.5	18.0	20.8	28.9
	108.8	128.5	135.4	165.8	161.2	156.8	156.1	181.5
Less: liabilities	37.5	37.6	50.8	67.7	68.7	66.3	67.7	80.3
Net worth	71.3	90.9	84.6	98.1	92.5	90.5	88.4	101.2
Net sales	150.4	181.3	182.1	227.4	219.7	225.4	209.2	231.8
Less: cost of goods sold	58.8	86.3	91.8	105.8	95.4	109.3	102.8	107.2
Gross profit	91.6	95.0	90.3	121.6	124.3	116.1	106.4	124.6
Less: other expenses	73.5	74.7	71.2	95.8	101.7	97.0	88.1	99.9
Net profit before income tax(b)	18.1	20.3	19.1	25.8	22.6	19.1	18.3	24.7
Add: investment income	0.2	0.2	0.3	0.7	0.4	0.6	0.6	0.4
Less: Dominion income tax	7.7	8.1	7.5	10.4	9.0	7.3	7.8	9.8
Net profit after income tax	10.6	12.4	11.9	16.1	14.0	12.4	11.1	15.3
Number of profit companies	177	152	143	181	161	170	128	178
Number of loss companies	37	68	67	64	54	50	96	51

(a) Excluding investments
(b) Excluding investment income

Source: Based on data from Department of National Revenue, Taxation Statistics

Table 24 (Cont'd)

FINANCIAL STATISTICS OF CHEMICAL INDUSTRIES
1956 TO 1963

Miscellaneous Chemical Products	1956	1957	1958	1959	1960	1961	1962	1963
			- million dollars -					
Current assets(a)	146.6	177.4	182.8	185.8	184.2	219.0	270.0	282.2
Fixed assets	319.5	388.1	516.8	542.6	552.4	646.4	748.0	835.7
Other assets(a)	13.0	11.3	15.7	17.9	15.5	21.6	25.6	28.6
Total assets before depreciation(a)	479.1	576.8	715.3	746.3	752.1	887.0	1,043.6	1,146.5
Less: accumulated depreciation	139.7	159.9	215.3	234.6	229.4	272.7	341.0	393.5
Total assets after depreciation(a)	339.4	416.9	500.0	511.7	522.7	614.3	702.6	753.0
Add: investments	44.7	136.8	132.6	80.1	132.2	204.1	188.9	185.7
	384.1	553.7	632.6	591.8	654.9	818.4	891.5	938.7
Less: liabilities	138.4	217.3	243.0	223.8	258.0	324.5	375.4	379.1
Net worth	245.7	336.4	389.6	368.0	396.9	493.9	516.1	559.6
Net sales	442.8	516.0	589.0	606.4	622.3	677.8	824.4	919.5
Less: cost of goods sold	271.0	334.8	418.8	423.2	418.4	469.0	578.1	631.3
Gross profit	171.8	181.2	170.2	183.2	203.9	208.8	246.3	288.2
Less: other expenses	137.9	143.8	126.8	123.7	151.7	162.4	185.0	210.9
Net profit before income tax(b)	33.9	37.4	43.4	59.5	52.2	46.4	61.3	77.3
Add: investment income	1.9	1.7	1.7	2.1	1.0	1.5	1.5	7.8
Less: Dominion income tax	14.4	14.2	16.6	24.7	21.7	22.4	27.9	29.9
Net profit after income tax	21.4	24.9	28.5	36.9	31.5	25.5	34.9	55.2
Number of profit companies	207	215	235	218	159	170	139	227
Number of loss companies	89	83	103	66	66	101	133	77

(a) Excluding investments
(b) Excluding investment income

Source: Based on data from Department of National Revenue, Taxation Statistics

Table 25

FINANCIAL STATISTICS, COMPARISON OF CERTAIN RATIOS,
CHEMICAL INDUSTRIES AND ALL MANUFACTURING, 1956 to 1963

	1956	1957	1958	1959	1960	1961	1962	1963
				- Per Cent -				
I Gross Profit to Net Sales								
All manufacturing	..	..	27.4	26.5	26.6	26.2	26.3	26.1
Chemical and Allied Ind.	44.4	39.0	34.7	35.4	37.8	34.8	35.2	35.8
Paint and Varnish Ind.	40.5	35.5	35.6	35.6	34.2	36.4	36.2	35.1
Soap and Toilet Prep.	50.5	48.3	45.9	41.7	47.8	44.0	46.3	43.9
Fertilizers and Ind. Chem.	41.2	32.8	26.2	25.8	28.9	25.8	29.7	30.2
Pharmaceutical Preparations	60.9	52.4	49.6	53.5	56.6	51.5	50.9	53.8
Miscellaneous Chemical Prod.	38.8	35.1	28.9	30.2	32.8	30.8	29.9	31.3
II Net Profit after Income Tax to Net Sales								
All manufacturing	4.4	4.1	3.9	4.2	3.8	4.1	4.4	4.3
Chemical and Allied Ind.	5.3	4.5	4.4	5.4	4.6	4.2	4.9	5.5
Paint and Varnish Ind.	3.3	3.3	3.1	4.5	2.0	3.6	2.5	3.5
Soap and Toilet Prep.	5.1	4.3	5.3	5.6	6.0	5.7	5.2	5.4
Fertilizers and Ind. Chem.	6.2	3.1	0.9	2.4	2.6	3.3	6.6	4.5
Pharmaceutical Preparations	7.0	6.8	6.5	7.1	6.4	5.5	5.3	6.6
Miscellaneous Chemical Prod.	4.8	4.8	4.8	6.1	5.1	3.8	4.2	6.0
III Net Profit after Income Tax to Net Worth								
All manufacturing	10.2	8.9	7.8	8.6	7.7	7.7	8.9	8.8
Chemical and Allied Ind.	9.9	8.2	8.0	10.2	8.3	7.0	8.3	9.6
Paint and Varnish Ind.	7.4	8.1	7.9	10.7	5.6	8.5	6.5	9.1
Soap and Toilet Prep.	11.9	10.8	14.0	13.2	15.1	15.2	13.8	14.5
Fertilizers and Ind. Chem.	9.4	5.4	1.6	4.1	3.6	4.6	8.1	5.7
Pharmaceutical Preparations	14.9	13.6	14.1	16.4	15.1	13.7	12.6	15.1
Miscellaneous Chemical Prod.	8.7	7.4	7.3	10.0	7.9	5.2	6.8	9.9

Source: Based on data from Department of National Revenue, Taxation Statistics

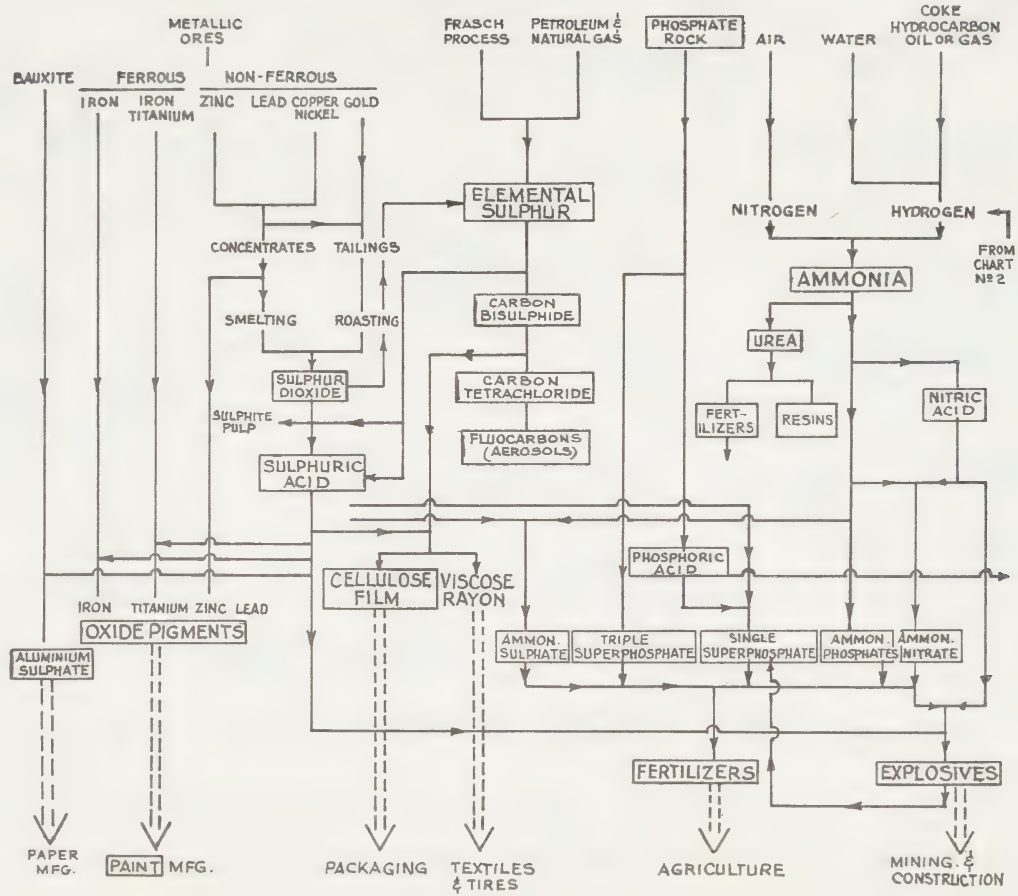
APPENDIX II

Flow Charts

1. Inorganics
2. Inorganic chemicals from salt
3. Organic chemicals from petroleum refining and natural gas treatment
4. Organic chemicals from coke, limestone and power
5. Organic chemicals from coal
6. Organic chemicals from vegetable and animal products
7. Petrochemical Operation (Dow Chemical of Canada, Ltd.)

Source of charts 1 to 6, Industry Committee for Reference 120, Chemicals
Source of Chart 7, Transcript Vol. 39 p. 5823

INORGANICS FLOW SHEET No. 1



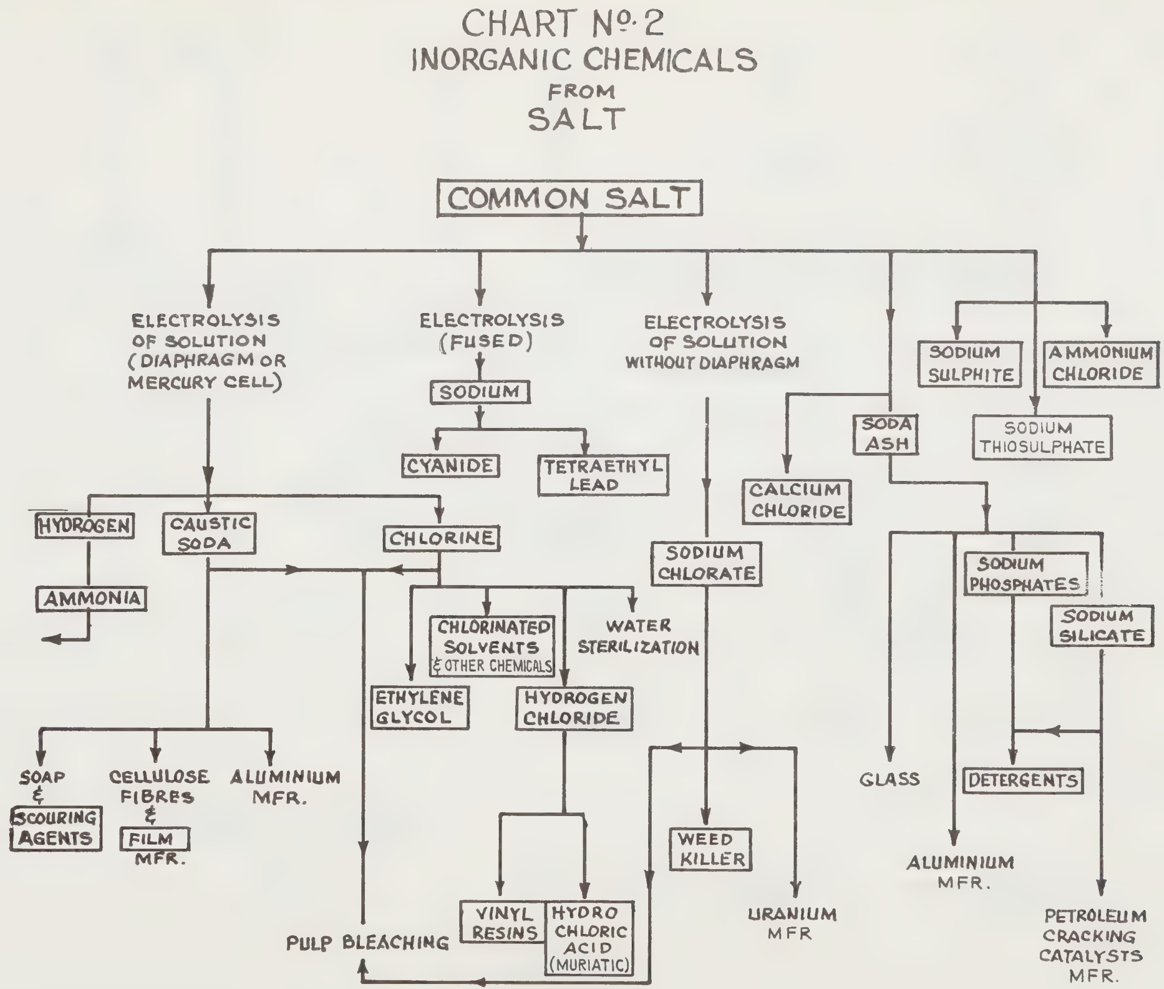


CHART Nº 2
INORGANIC CHEMICALS
FROM
SALT
COMMON SALT
ELECTROLYSIS OF SOLUTION (DIAPHRAGM OR MERCURY CELL)
ELECTROLYSIS (FUSED)
ELECTROLYSIS OF SOLUTION WITHOUT DIAPHRAGM
SODIUM SULPHITE
AMMONIUM CHLORIDE
SODIUM
SODA ASH
SODIUM THIOSULPHATE
CYANIDE
TETRAETHYL LEAD
CALCIUM CHLORIDE
HYDROGEN
CAUSTIC SODA
CHLORINE
SODIUM CHLORATE
SODIUM PHOSPHATES
SODIUM SILICATE
AMMONIA
CHLORINATED SOLVENTS & OTHER CHEMICALS
WATER STERILIZATION
ETHYLENE GLYCOL
HYDROGEN CHLORIDE
SOAP & SCOURING AGENTS
CELLULOSE FIBRES & FILM MFR.
ALUMINIUM MFR.
GLASS
DETERGENTS
WEED KILLER
URANIUM MFR
ALUMINIUM MFR.
VINYL RESINS
HYDRO CHLORIC ACID (MURIATIC)
PULP BLEACHING
PETROLEUM CRACKING CATALYSTS MFR.

CHART № 3
ORGANIC CHEMICALS
FROM
PETROLEUM REFINING & NATURAL GAS TREATMENT

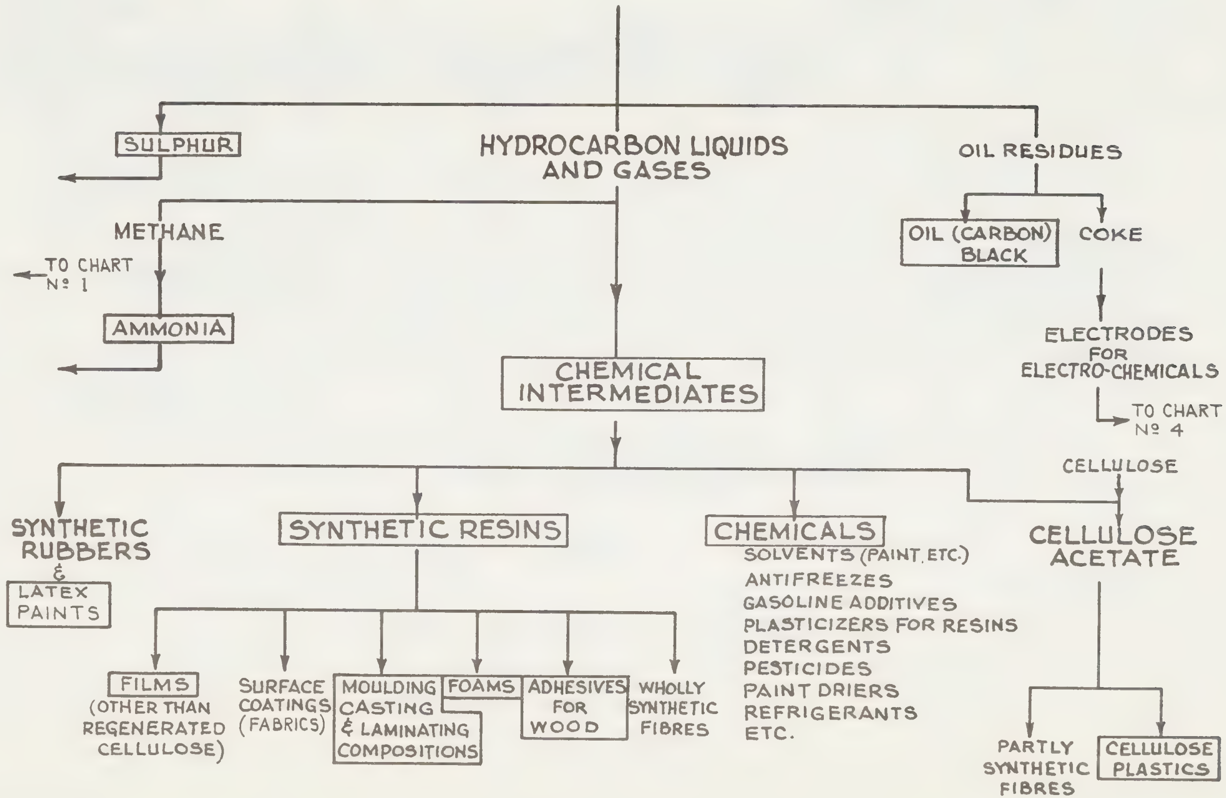


CHART Nº 4
ORGANIC CHEMICALS
FROM
COKE, LIMESTONE & POWER

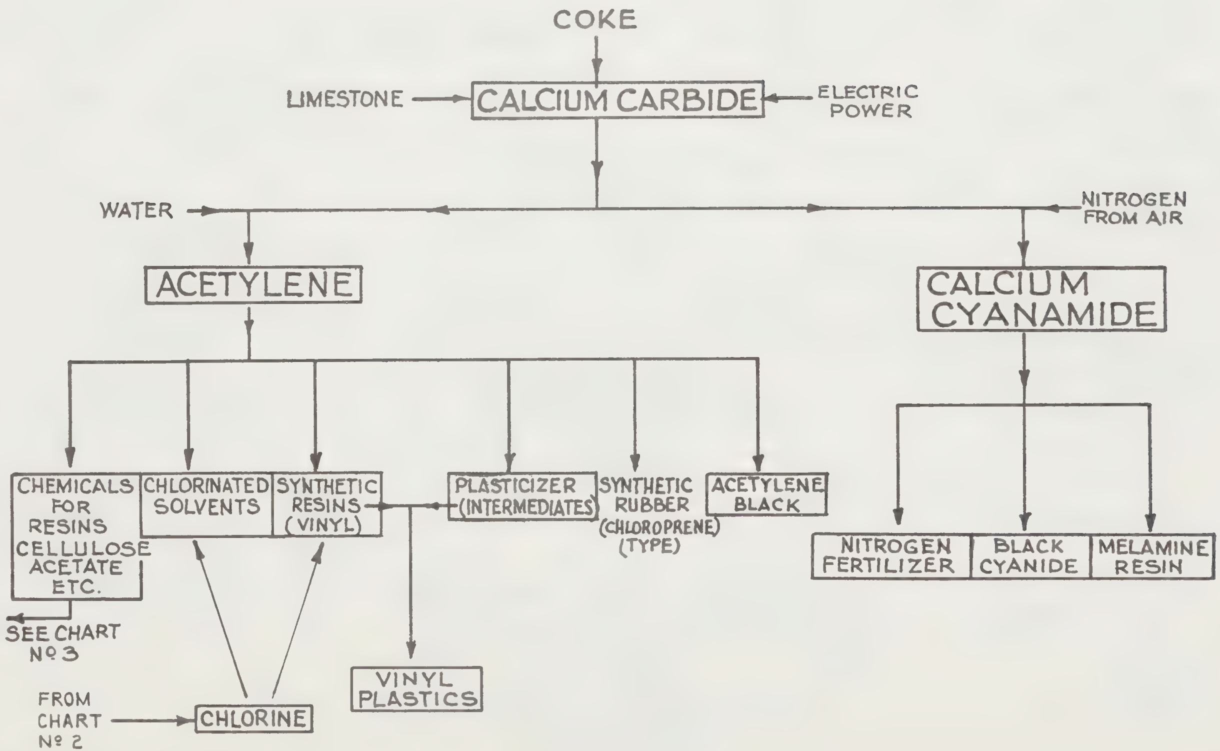


CHART No. 5
ORGANIC CHEMICALS
FROM
COAL

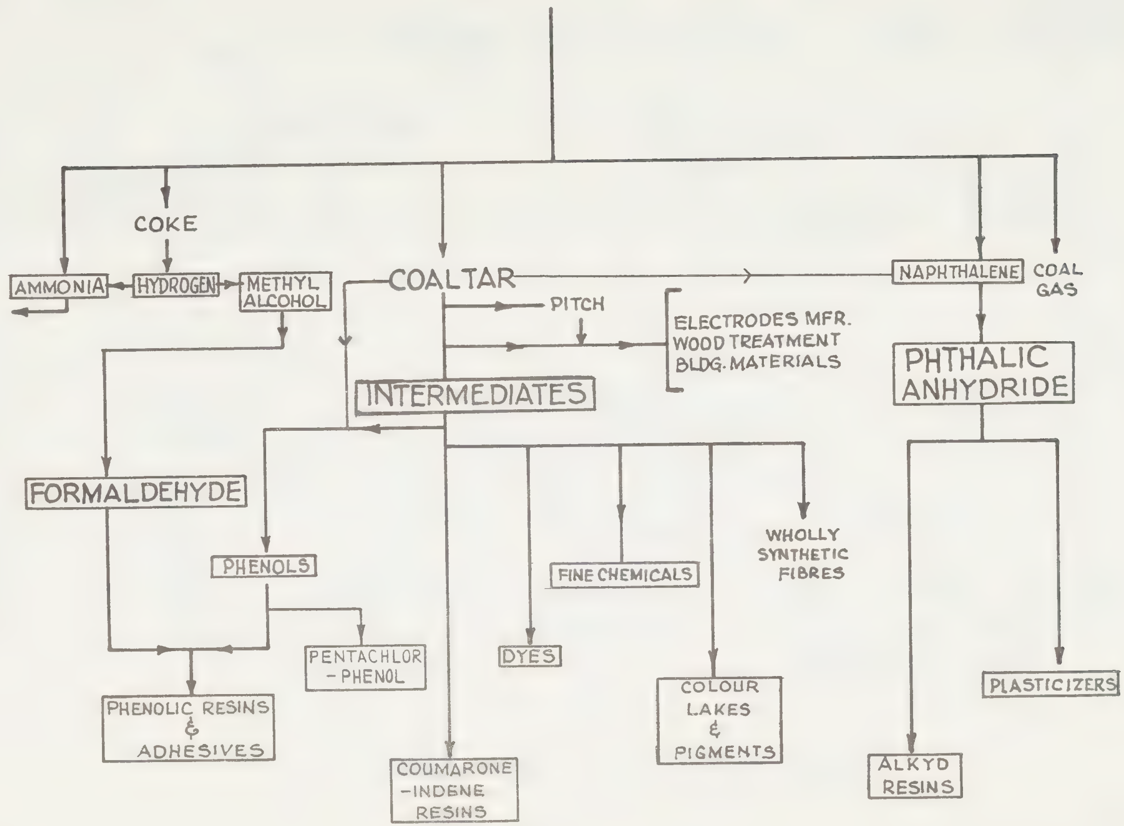


CHART No. 6
ORGANIC CHEMICALS
FROM
VEGETABLE & ANIMAL PRODUCTS

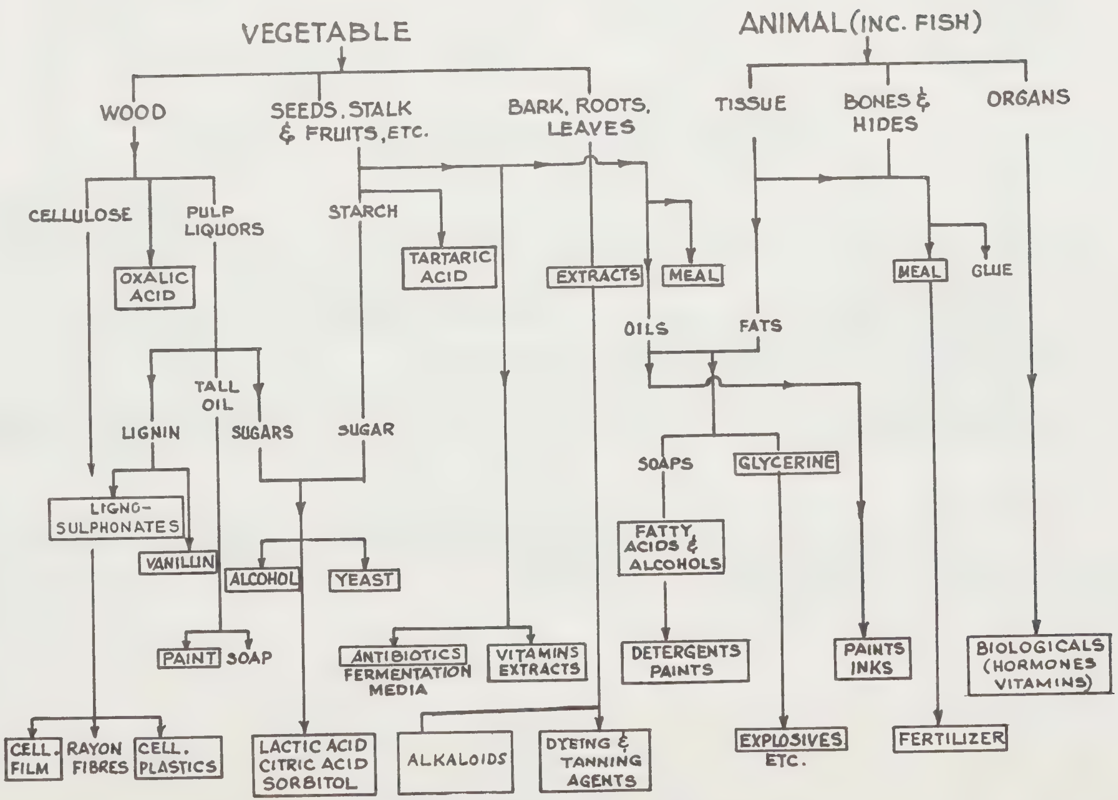
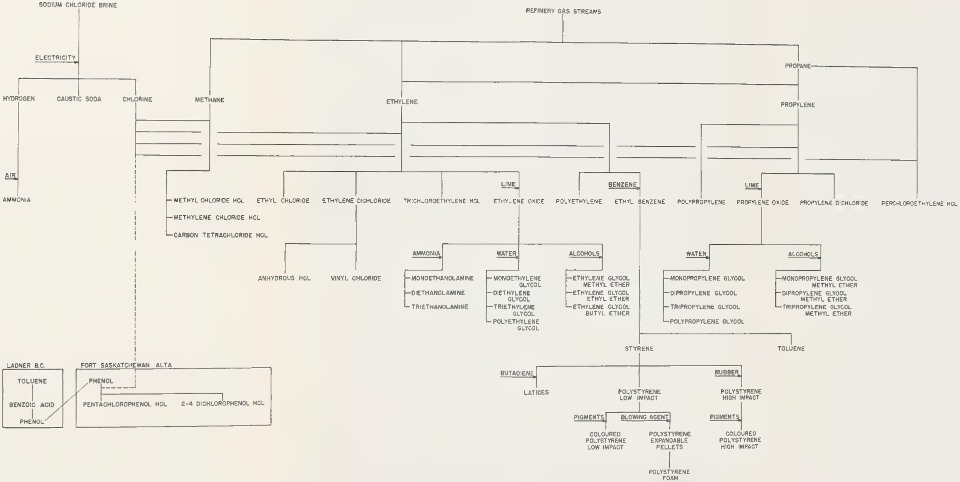


CHART No 7
DOW CHEMICAL OF CANADA, LIMITED
PETROCHEMICAL OPERATION



APPENDIX III

DRAFT RULES AND NOTES

Prefatory Note

The Brussels Nomenclature is an integral system of headings, Section and Chapter Notes and Interpretative Rules, together with Explanatory Notes to aid in understanding and interpreting the meanings of the headings, notes and rules. Under the jurisdiction of the Customs Co-operation Council, these provisions are amended from time to time and the administration of tariffs based on the Brussels Nomenclature is also assisted by decisions of technical committees recorded in the Compendium of Classification Opinions.

A large part of the Recommended Schedule arising out of Reference 120 has been based on the Brussels Nomenclature. In Volume 1 of its Report, on page 30, the Tariff Board also recommended that statutory authority be given to the Governor-in-Council to prescribe rules and explanatory notes to aid in the interpretation of these items and that in the formulation thereof, the Governor-in-Council should be guided as nearly as may be by the relevant Brussels publications.

For this recommendation to be effective, at least certain notes are essential; an inter-departmental technical committee has adapted, for Canadian use, the Interpretative Rules, Section and Chapter Notes and some parts of the Explanatory Notes. It is anticipated that, in time, all the relevant Explanatory Notes will be considered for adaptation to Canadian use; in the meantime, recourse might be had to the Brussels Explanatory Notes.

The portion of the recommended schedule based on the Brussels Nomenclature consists of a large part of Section VI of the Nomenclature, together with twelve items derived from other Sections. For the purposes of these draft Notes, it has been assumed that all the recommended items will form one Section of the Canadian Customs Tariff.

These notes are not identical with the relevant portions of the Brussels Nomenclature and Notes. They are designed for application only to a portion of the Customs Tariff and some modifications were necessary on this account. Moreover, the Tariff Board, in its recommendations, made deliberate departures from the wording or coverage of certain headings.

The draft which follows is not necessarily in the same format as might eventually be adopted. The Interpretative Rules are given first, with the rules themselves in capitals and the appropriate commentary following each rule. This is followed by an explanation of the major changes. There follow draft Section, Chapter and, where only one heading of a chapter has been used, Item Notes, each followed by a draft Explanatory Note and an explanation of the changes from the Brussels original.

In order that the changes may easily be followed, all major deletions from the original have been indicated. Certain technical alterations (e.g. "heading" to "Recommended Item") are not indicated. Other minor changes in wording, arising largely out of minor differences between the Recommended Schedule and the Brussels Nomenclature, are indicated by a single asterisk (*). In certain cases where words have been added for clarity, these are underlined. Major changes, which are explained, are indicated by a double asterisk (**). An asterisk or a double asterisk preceding a number or a letter indicates that all that comes under that number or letter may contain changes.

SECTION ( )

PRODUCTS OF CHEMICAL AND ALLIED INDUSTRIES

NOTE: This title is provided for ease of reference only. The form in which the Recommended Schedule will appear in the Canadian Customs Tariff was not known to those preparing these Notes. For this purpose it has been assumed that the Recommended Items derived from the Brussels Nomenclature will constitute one section of Schedule "A", which will be subject to the rules and notes. It has also been assumed that Recommended Item R-39 will be incorporated into this Section in an appropriate place. With very limited exceptions, there are no cross-references in these Notes to any tariff item not forming part of this Section as classification of goods in such items was not part of Reference 120.

** RULES FOR THE INTERPRETATION OF THIS SECTION (Recommended Items 15.10 to 39.07 inclusive)

RULE 1

* THE TITLES OF CHAPTERS /AND SUB-CHAPTERS/ ARE PROVIDED FOR EASE OF REFERENCE ONLY; FOR LEGAL PURPOSES, CLASSIFICATION SHALL BE DETERMINED ACCORDING TO THE TERMS OF THE RECOMMENDED ITEMS AND SUB-ITEMS AND ANY RELEVANT SECTION, CHAPTER OR ITEM NOTES AND, PROVIDED SUCH ITEMS OR NOTES DO NOT OTHERWISE REQUIRE, ACCORDING TO THE FOLLOWING PROVISIONS.

* COMMENTARY (from the Explanatory Notes)

(I). This Section sets out in systematic form certain goods handled in international trade. It groups these goods in Chapters /and sub-Chapters/ which have been given titles indicating as concisely as possible the types of products they cover. The variety and number of articles classified in a Chapter are such that it is impossible to cover them all or to cite them separately in the title.

(II). Rule 1 begins therefore by establishing that the titles are provided for ease of reference only. They accordingly have no legal bearing on classification.

(III). The second part of this Rule provides that classification shall be determined:

(a) According to the terms of the recommended items and sub-items and any relevant Section, Chapter or Item Notes, and

(b) Where necessary, according to the provisions of Rules 2, 3 and 4, provided the Recommended Items or Notes do not otherwise require.

(IV). The first of these provisions is self-evident, and many goods are classified without recourse to any further consideration of the Interpretative Rules (e.g., sulphur dioxide, recommended item 28.07).

(V). In the second provision, the expression "provided such items or Notes do not otherwise require" is necessary to make it quite clear that the terms of the items and sub-items and any relevant Section, Chapter or Item Notes are paramount, i.e., they are the first consideration in determining classification.

RULE 2

* ANY REFERENCE IN A RECOMMENDED ITEM TO A MATERIAL OR SUBSTANCE SHALL BE TAKEN TO INCLUDE A REFERENCE TO MIXTURES OR COMBINATIONS OF THAT MATERIAL OR SUBSTANCE WITH OTHER MATERIALS OR SUBSTANCES. ANY REFERENCE TO GOODS OF A GIVEN MATERIAL OR SUBSTANCE SHALL BE TAKEN TO INCLUDE A REFERENCE TO GOODS CONSISTING WHOLLY OR PARTLY OF SUCH MATERIAL OR SUBSTANCE. THE CLASSIFICATION OF GOODS CONSISTING OF MORE THAN ONE MATERIAL OR SUBSTANCE SHALL BE ACCORDING TO THE PRINCIPLES OF RULE 3.

* COMMENTARY (from the Explanatory Notes)

(I). This Rule is concerned with mixtures and combinations of materials or substances, and with goods consisting of two or more materials or substances. The recommended items to which it refers are items in which there is a reference to a material or substance, and items in which there is a reference to goods of a given material or substance. It will be noted that the Rule applies only if the Recommended Items or sub-items or the Section, Chapter or Item Notes do not otherwise require.

(II). The effect of the Rule is to extend any Recommended Item referring to a material or substance to include goods consisting partly of that material or substance. It does not, however, widen the item so as to cover goods which cannot appropriately be regarded as answering the description in the item. In other words, the addition of a new material or substance should not alter the original character of the goods mentioned in the item.

(III). In many cases under Rule 2, goods will become prima facie classifiable in two or more Recommended Items or sub-items. As shown in the final sentence, it is then Rule 3 which determines the classification.

RULE 3

* WHEN FOR ANY REASON, GOODS ARE, PRIMA FACIE, CLASSIFIABLE UNDER TWO OR MORE RECOMMENDED ITEMS OR SUB-ITEMS, CLASSIFICATION SHALL BE EFFECTED AS FOLLOWS:

(a) THE ITEM OR SUB-ITEM WHICH PROVIDES THE MOST SPECIFIC DESCRIPTION SHALL BE PREFERRED TO ITEMS OR SUB-ITEMS PROVIDING A MORE GENERAL DESCRIPTION.

(b) MIXTURES AND COMPOSITE GOODS WHICH CONSIST OF DIFFERENT MATERIALS OR ARE MADE UP OF DIFFERENT COMPONENTS AND WHICH CANNOT BE CLASSIFIED BY REFERENCE TO (a) SHALL BE CLASSIFIED AS IF THEY CONSISTED OF THE MATERIAL OR COMPONENT WHICH GIVES THE GOODS THEIR ESSENTIAL CHARACTER, INSOFAR AS THIS CRITERION IS APPLICABLE.

(c) WHEN GOODS CANNOT BE CLASSIFIED BY REFERENCE TO (a) OR (b), THEY SHALL BE CLASSIFIED UNDER THE RECOMMENDED ITEMS OR SUB-ITEMS WHICH INVOLVE THE HIGHEST RATE OF DUTY.

* COMMENTARY (from the Explanatory Notes)

(I). This Rule provides three methods of classifying goods which, prima facie, fall under two or more recommended items or sub-items, either under the terms of Rule 2 or for any other reason. These methods operate in the order in which they are set out in the Rule. Thus Rule 3 (b) operates only if Rule 3 (a) fails in classification, and if both Rules 3 (a) and (b) fail, Rule 3 (c) will apply. The order of priority is therefore (a) specific description; (b) essential character; (c) highest rate of duty, and by these successive processes all goods within the recommended items and sub-items of this Section can be classified.

(II). The Rule can only take effect provided the terms of recommended items or sub-items or Section, Chapter or Item Notes do not otherwise require. For example, Note 3 to Chapter 29 determines the classification of goods which could be included in two or more Recommended Items of that Chapter; such goods are to be classified in the latest of those items.

RULE 3 (a)

(III). The first method of classification is provided in Rule 3 (a) under which the recommended item or sub-item which provides the most specific description of the goods is to be preferred to an item which provides a more general description.

(IV). It is not practicable to lay down hard and fast rules by which to determine whether one recommended item or sub-item more specifically describes the goods than another, but in general it may be said that:

(a) A description by name is more specific than a description by class.

(b) If the goods answer to a description which more clearly identifies them, that description is more specific than one where identification is less complete.

RULE 3 (b)

(V). The second method of classification is to be applied only if Rule 3 (a) fails.

It relates only to:

(i) Mixtures.

(ii) Composite goods consisting of different materials.

(iii) Composite goods consisting of different components.

(VI). In all these cases the goods are to be classified as if they consisted of the material or component which gives them their essential character.

(VII). The factor which determines essential character will vary as between different kinds of goods. It may, for example, be determined by the nature of the material or component, its bulk, quantity, weight or value, or by the role of a constituent material in relation to the use of the goods.

RULE 3 (c)

(VIII). When goods cannot be classified by reference to Rules 3 (a) and 3 (b), they are to be classified under that one of the appropriate recommended items which involves the highest rate of duty. Where applicable, classification as between those items is to be determined by reference to the appropriate sub-item involving the highest rate of duty.
(See also Section 50 of the Customs Act, R.S.C. 1952, c. 58, as amended).

RULE 4

* WHERE IN A NOTE TO A CHAPTER OR ITEM IT IS PROVIDED THAT CERTAIN GOODS ARE NOT COVERED BY THAT CHAPTER OR ITEM A REFERENCE BEING MADE TO ANOTHER CHAPTER OR TO A PARTICULAR ITEM, THE NOTE SHALL, UNLESS THE CONTEXT REQUIRES OTHERWISE, BE TAKEN TO REFER TO ALL THE GOODS FALLING WITHIN THAT OTHER CHAPTER OR ITEM NOTWITHSTANDING THAT ONLY CERTAIN OF THOSE GOODS ARE REFERRED TO BY DESCRIPTION IN THE NOTE.

* COMMENTARY (from the Explanatory Notes)

(I). Some Chapter and Item Notes exclude goods intended to be classified elsewhere in the Section and give a reference to the Chapter or item where such goods may fall.

(II). The purpose of the present Rule is to make it clear that where in such cases the exclusion refers only to certain goods, it extends to all goods falling within the Chapter or item mentioned in the Note.

(III). The Rule applies unless the context of the particular exclusion concerned or of any other provision in the Section directly related thereto leaves no doubt that the exclusion is to be read in a limitative sense. It follows, in particular, that where the Note is expressed in limitative terms, it applies to the goods specified in the Note and to those goods only.

** RULE 5

Deleted; inapplicable in the context of the Canadian Tariff, particularly in view of item 711.

Explanation of Changes

These Interpretative Rules are adapted from the Interpretative Rules to the Brussels Nomenclature and the Commentary on each rule is adapted from that which appears in the Explanatory Notes to the Nomenclature. They are, however, to be limited to those recommended items derived from the Brussels Nomenclature, and their sub-items. In this context, it is anticipated that classification will almost always be possible through the application of Rule 1, in a few cases subject to the application of Rule 4 to the relevant Chapter or Item Notes.

In many countries using the Brussels Nomenclature, the application of the rules to sub-divisions of headings is effected by an additional Rule. In this adaptation, however, this has been done by changes to the Rules themselves. Apart from this, all changes to Rules 1 to 4 arise from the use of only part of the Nomenclature.

Rule 5 of the Nomenclature, which provides that "Goods not falling within any heading of the Nomenclature shall be classified under the heading appropriate to the goods to which they are most akin", is considered to be inapplicable to this Section. Recommended Item 38.19 is believed to provide a place for almost all the unenumerated products of this Section. Any which could not be entered there would probably be classified under tariff item 711 if they are not provided for elsewhere in Schedule "A" of the Customs Tariff.

The words "and sub-chapters" are placed in square brackets because it is not known whether any sub-chapter titles will appear in the Schedule when it is incorporated into the Canadian Customs Tariff. If there should also be no chapter titles, Rule 1 and its commentary would require amendment.

SECTION ( )

PRODUCTS OF THE CHEMICAL AND ALLIED INDUSTRIES

Section Notes

* 1. - (a) Goods (other than radio-active ores) answering to a description in Recommended Item 28.50 or 28.51 are to be classified in those items and in no other item of this Section.

(b) Subject to paragraph (a) above, goods answering to a description in Recommended Item 28.49 or 28.52 are to be classified in those items and in no other Recommended Item from 28.01 to 38.19 inclusive.

* 2. - Subject to Note 1 above, goods classifiable within Recommended Item 32.09 or 37.08 by reason of being put up in forms or packings of a kind sold by retail are to be classified in those items and in no other item of this Section.

(Additional Notes)

** 3. - Notwithstanding Notes 1 and 2:

(a) Recommended Item 31.00(1) has priority over all other items in Schedule "A";

(b) subject to paragraph (a) of this Note, Recommended Item 38.11 has priority over all other Recommended Items in this Section;

(c) subject to paragraph (a) of this Note, the Recommended Items of this Section do not necessarily have priority over items listed elsewhere in Schedule "A" which provide for goods imported for specified uses.

** 4. - For the purpose of this Section, each of the chemical elements has been assigned a description as listed below. All elements except those classified as base metals and precious metals are included in this Section. Base metals and precious metals answering to a description in Recommended Item 28.49, 28.50 or 28.51 are, however, included in this Section.

ELEMENT	SYMBOL	CLASSIFICATION
Actinium (element 89)	Ac	Radio-active element.
Aluminum	Al	Base metal.
Americium (element 95)	Am	Radio-active element.
Antimony	Sb	Base metal.
Argon	A	Rare gas.

ELEMENT	SYMBOL	CLASSIFICATION
Arsenic	As	Non-metal.
Astatine (element 85)	At	Radio-active element.
Barium	Ba	Alkaline-earth metal.
Berkelium (element 97)	Bk	Radio-active element.
Beryllium	Be	Base metal.
Bismuth	Bi	Base metal.
Boron	B	Non-metal.
Bromine	Br	Non-metal.
Cadmium	Cd	Base metal.
Caesium	Cs	Alkali metal.
Calcium	Ca	Alkaline-earth metal.
Californium (element 98)	Cf	Radio-active element.
Carbon	C	Non-metal.
Celtium (see Hafnium)		
Cerium	Ce	Rare earth metal.
Chlorine	Cl	Non-metal.
Chromium	Cr	Base metal.
Cobalt	Co	Base metal.
Columbium (see Niobium)		
Copper	Cu	Base metal.
Curium (element 96)	Cm	Radio-active element.
Dysprosium	Dy	Rare earth metal.
** Einsteinium (element 99)	Es	Radio-active element.
Erbium	Er	Rare earth metal.
Europium	Eu	Rare earth metal.
** Fermium (element 100)	Fm	Radio-active element.
Fluorine	F	Non-metal.
Francium (element 87)	Fr	Radio-active element.
Gadolinium	Gd	Rare earth metal.
Gallium	Ga	Base metal.
Germanium	Ge	Base metal.
Glucinum (see Beryllium)		
Gold	Au	Precious metal.
Hafnium	Hf	Base metal.
Helium	He	Rare gas.
Holmium	Ho	Rare earth metal.
Hydrogen	H	Non-metal
Illinium (see Promethium)		
Indium	In	Base Metal.
Iodine	I	Non-metal.
Iridium	Ir	Precious metal.
Iron	Fe	Base metal.
Krypton	Kr	Rare gas.
Lanthanum	La	Rare earth metal.
** Lawrencium (element 103)	Lw	Radio-active element.
Lead	Pb	Base metal.
Lithium	Li	Alkali metal.
Lutetium	Lu	Rare earth metal.
Magnesium	Mg	Base metal.
Manganese	Mn	Base metal.
Masurium (see Technetium)		

	ELEMENT	SYMBOL	CLASSIFICATION
**	Mendelevium (element 101)	Md	Radio-active element.
	Mercury	Hg	Metal.
	Molybdenum	Mo	Base metal.
	Neodymium	Nd	Rare earth metal.
	Neon	Ne	Rare gas.
	Neptunium (element 93)	Np	Radio-active element.
	Nickel	Ni	Base metal.
	Niobium	Nb	Base metal.
	Nitrogen	N	Non-metal.
**	Nobelium (element 102)	No	Radio-active element.
	Osmium	Os	Precious metal.
	Oxygen	O	Non-metal.
	Palladium	Pd	Precious metal.
	Phosphorus	P	Non-metal.
	Platinum	Pt	Precious metal.
	Plutonium (element 94)	Pu	Fissile element.
	Polonium	Po	Radio-active element.
	Potassium	K	Alkali metal.
	Praseodymium	Pr	Rare earth metal.
	Promethium (element 61)	Pm	Radio-active element.
	Protactinium (element 91)	Pa	Radio-active element.
	Radium (element 88)	Ra	Radio-active element.
	Radon (element 86)	Rn	Radio-active element.
	Rhenium	Re	Base metal.
	Rhodium	Rh	Precious metal.
	Rubidium	Rb	Alkali metal.
	Ruthenium	Ru	Precious metal.
	Samarium	Sm	Rare earth metal.
	Scandium	Sc	Rare earth metal.
	Selenium	Se	Non-metal.
	Silicon	Si	Non-metal.
	Silver	Ag	Precious metal.
	Sodium	Na	Alkali metal.
	Strontium	Sr	Alkaline-earth metal.
	Sulphur	S	Non-metal.
	Tantalum	Ta	Base-metal.
	Technetium (element 43)	To	Radio-active element.
	Tellurium	Te	Non-metal.
	Terbium	Tb	Rare earth metal.
	Thallium	Tl	Base metal.
	Thorium	Th	Base metal.
	Thulium	Tm	Rare earth metal.
	Tin	Sn	Base metal.
	Titanium	Ti	Base metal.
	Tungsten	W	Base metal.
	Uranium, natural or enriched	U	Fissile element.
	Uranium, depleted	U	Base metal.
	Vanadium	V	Base metal.
	Wolfram (see Tungsten)		
	Xenon	Xe	Rare gas.
	Ytterbium	Yb	Rare earth metal.
	Yttrium	Y	Rare earth metal.
	Zinc	Zn	Base metal.
	Zirconium	Zr	Base metal.

Explanatory Notes

* Section Note 1.

Under the provisions of paragraph (a) of this Note, except where Note 3 is applicable, all radio-active chemical elements and radio-active isotopes, and compounds of such elements and isotopes (whether inorganic or organic, and whether or not chemically defined), are classified under Recommended Item 28.50, even though they could also fall under some other item of this Section. Thus, radio-active glycerol and radio-active sodium chloride fall within Recommended Item 28.50 and not in Recommended Items 15.11 and 25.01 respectively. Similarly, radio-active ethyl alcohol, radio-active gold and radio-active cobalt are classified in Recommended Item 28.50. It should be noted, however, that radio-active ores are classified as ores, as elsewhere provided for in Schedule "A".

In the case of non-radio-active isotopes and their compounds, the Note provides that these (whether inorganic or organic, and whether or not chemically defined) are classified in Recommended
** Item 28.51. Thus, the isotope of carbon, <u>known as carbon 13</u>, is classified under Recommended Item 28.51 and not under Recommended Item 28.03.

Paragraph (b) of the Note provides that, except where Note 3 is applicable, goods described in Recommended Item 28.49 or 28.52 are to be classified under whichever of those items is appropriate and under no other Recommended Item from 28.01 to 38.19 inclusive, provided always that they are not radio-active or in the form of isotopes (in which case they are classified in either Recommended Item 28.50 or Recommended Item 28.51). This paragraph of the Note provides, therefore, that, for example, silver caseinate is classified in Recommended Item 28.49, and that silver nitrate, even when put up for sale by retail ready for photographic use, is clasified in Recommended Item 28.49 and not in Recommended Item 37.08.

It should be noted, however, that Recommended Items 28.49 and 28.52 take precedence only over Recommended Items 28.01 to 38.19 inclusive, and not necessarily over other parts of Schedule "A" of the Customs Tariff.

Explanation of Changes

Changes in Section Notes 1 and 2 arise only from the adoption of only certain items based on the Brussels Nomenclature and the limitation of Notes to this Section.

Chapter Note 3 has been added to give priority to those Recommended Items intended to have such priority and to provide that the items of the Section do not necessarily override end-use items elsewhere in Schedule "A".

Chapter Note 4 is derived from the Explanatory Notes to the Brussels Nomenclature. It has been made a Section Note because of references in the Notes and in items of the recommended schedule to different groups of elements, which, in the Brussels Nomenclature, are defined elsewhere. Known elements not included in the list in the Brussels Explanatory Notes have been added.

Changes in the Explanatory Notes are consequential to changes in the Chapter Notes, except that in the second paragraph the words "known as carbon 13" have been added for clarity and to prevent confusion concerning carbon 14, which is a radio-active isotope of Recommended Item 28.50.

CHAPTER 15

** FATTY ACIDS, ACID OILS, FATTY ALCOHOLS AND GLYCEROL

** Chapter Notes.

1. This Chapter is taken to apply to:

   (a) Industrial mixtures, including reaction blends, of monocarboxylic acids, whether or not hydrogenated or dehydrated, obtained from natural fatty materials, provided that no one acid constitutes as much as 90 per cent by weight of the product;

   (b) Industrial mixtures, including reaction blends, of monocarboxylic acids obtained by synthesis, comprising acids of high molecular weight, provided that no one acid constitutes as much as 90 per cent by weight of the product, and provided that no acid in the mixture possesses any one of the following structural features:

   (i) any atoms other than those of carbon, hydrogen or oxygen,

   (ii) polyacidity,

   (iii) if linear, fewer than 6 carbon atoms,

   (iv) if branched, fewer than 9 carbon atoms,

   (v) carbocyclic or heterocyclic rings, except where the acid exactly reproduces a natural fatty acid having such ring, or

   (vi) oxygen functions other than monocarboxyl, except where the acid exactly reproduces a natural fatty acid having the same structure;

   (c) Mixtures containing

   (i) one or more natural fatty acids meeting the criteria of paragraph (a), and

   (ii) one or more synthetic acids meeting the criteria of paragraph (b),

   provided that the mixture does not contain as much as 90 per cent by weight of any one chemical compound;

(d) Tall oil products containing by weight 90 per cent or more of fatty acids, calculated on the weight of the dry anhydrous product;

(e) Acid oils of other than vegetable origin, with a free fatty acid content of less than 90 per cent by weight;

(f) Industrial mixtures, including reaction blends, of monohydric alcohols obtained by catalytic reduction of the acids of paragraph (a) or of their esters, or by saponification of sperm oil, provided that no one alcohol constitutes as much as 90 per cent by weight of the product;

(g) Industrial mixtures, including reaction blends, of monohydric alcohols obtained by synthesis, comprising alcohols of high molecular weight, provided no one alcohol constitutes as much as 90 per cent by weight of the product, and provided that no alcohol in the mixture possesses any one of the following structural features:

(i) any atoms other than those of carbon, hydrogen or oxygen,

(ii) if linear, fewer than 6 carbon atoms,

(iii) if branched, fewer than 9 carbon atoms,

(iv) carbocyclic or heterocyclic rings except where the alcohol exactly reproduces a natural fatty alcohol having such ring,

(v) oxygen functions other than monohydroxyl, except where the alcohol exactly reproduces a natural fatty alcohol having the same structure;

(h) Mixtures containing

(i) one or more natural fatty alcohols meeting the criteria of paragraph (f), and

(ii) one or more synthetic alcohols meeting the criteria of paragraph (g),

provided that the mixture does not contain as much as 90 per cent by weight of any one chemical compound;

(i) Glycerol, crude or refined, natural or synthetic; and

(j) Glycerol lyes.

2. This Chapter does not cover:

   (a) Separate chemically defined compounds other than glycerol;

   (b) Degras, stearin pitch, residues from the distillation of wool grease, glycerol pitch;

   (c) Fatty acids containing 90 per cent or more by weight of any one acid (Recommended Item 29.14);

   (d) Fatty alcohols containing 90 per cent or more by weight of any one alcohol (Recommended Item 29.04);

   (e) Medicaments;

   (f) Essential oils, and blends thereof;

   (g) Perfumery, cosmetics and toilet preparations;

   (h) Soaps and soapstocks;

   (i) Synthetic wax (Recommended Item R-39);

   (j) Dimerised and trimerised fatty acids (Recommended Item 38.19); or

   (k) Any other products falling within any Recommended Item from 28.01 to 38.19 inclusive.

** Explanatory Notes

Recommended Item 15.10 covers industrial fatty acids, fatty alcohols, their synthetic substitutes and certain acid oils.

Note 1(a) refers to such acids derived from natural fatty sources, whether or not hydrogenated or dehydrated.

Note 1(b) refers to those industrial mixtures and reaction blends of synthetic monocarboxylic acids which commonly serve as substitutes for natural fatty acids. Their several chemical structures, therefore, may be expected to approximate those of the naturally occurring acids of fats, and, accordingly, the item does not include industrial mixtures and reaction blends which contain any acid which possesses any one of the following structural features:

any atoms other than those of carbon, hydrogen or oxygen,
polyacidity,
if linear, fewer than six carbon atoms,

if branched, fewer than nine carbon atoms,
carbocyclic or heterocyclic rings except where the acid exactly reproduces a natural fatty acid having such ring, or
oxygen functions other than monocarboxyl, except where the acid exactly reproduces a natural fatty acid having the same structure.

Note 1(c) refers to mixtures containing both natural and synthetic monocarboxylic acids provided that such natural acids would be allowed in a mixture described in Note 1(a) and such synthetic acids would be allowed in a mixture described in Note 1(b). The final proviso would exclude, for example, a mixture composed 45 per cent of isolated lauric acid of natural origin, 50 per cent of isolated lauric acid of synthetic origin and 5 per cent of other acids, when the resulting mixture contains more than 90 per cent of lauric acid.

Note 1(d) specifies those tall oil products which are to be considered tall oil fatty acids for the purposes of Recommended Item 15.10. Other tall oil products are classified elsewhere, e.g., a tall oil product containing 85 per cent fatty acids is classified as tall oil in Recommended Item 38.05.

Note 1(g) has reference to those industrial mixtures and reaction blends of synthetic monohydric alcohols which commonly serve as substitutes for those alcohols obtained from natural fatty acids or their esters. Their several chemical structures, therefore, may be expected to approximate those of the natural fatty alcohols, and, accordingly, the item does not include industrial mixtures and reaction blends which contain any alcohol which possesses any one of the following structural features:

any atoms other than those of carbon, hydrogen and oxygen,
if linear, fewer than six carbon atoms,
if branched, fewer than nine carbon atoms,
carbocyclic or heterocyclic rings except where the alcohol exactly reproduces a natural fatty alcohol having such ring, or
oxygen functions other than monohydroxyl, except where the alcohol exactly reproduces a natural fatty alcohol having the same structure.

Note 1(h) refers to mixtures containing both natural and synthetic monohydric alcohols provided that such natural alcohols would be allowed in a mixture described in Note 1(f) and such synthetic alcohols would be allowed in a mixture described in Note 1(g). The final proviso would exclude, for example, a mixture composed 45 per cent of isolated lauryl alcohol of natural origin, 50 per cent of isolated lauryl alcohol of synthetic origin and 5 per cent of other alcohols, when the resulting mixture contains more than 90 per cent of lauryl alcohol.

Explanation of Changes

Because only two headings of Chapter 15 have been used as a basis for recommended items, and because the Board has considerably amplified the wording of heading 15.10 in its recommended item, it has been felt necessary to prepare completely new notes for this Chapter.

Chapter Note 1 is based on the best information available as to the fatty acids, fatty alcohols, etc., considered admissible under the heading by countries using the Brussels Nomenclature, modified to meet the apparent intentions of the Board in the wording used in Recommended Item 15.10. Note 1(e) takes into account Recommended Item XII of the Board's Report on Reference 131 - Oil Seeds, Vegetable Oils and Related Products. The Explanatory Notes elaborate to some extent on Chapter Note 1.

Chapter Note 2 is based on the exclusions from Chapter 15 of the Nomenclature, exclusions mentioned in the Explanatory Notes to headings 15.10 and 15.11 of the Nomenclature, classifications in the Brussels Compendium of Classification Opinions and the wording of other headings of Chapter 15 which cover products by name which cannot, therefore, be in Recommended Item 15.10 or 15.11.

CHAPTER 25

* SALT; SULPHUR; EARTH COLOURS

Chapter Notes.

1. Except where the context otherwise requires, the Recommended Items of this Chapter are to be taken to apply only to goods which are in the crude state, or which have been washed (even with chemical substances eliminating the impurities without changing the structure of the product), crushed, ground, powdered, levigated, sifted, screened, concentrated by flotation, magnetic separation or other mechanical or physical processes (not including crystallisation) but not calcined or subjected to any further process other than a process specially mentioned in any Recommended Item in respect of the goods described therein.

2. This Chapter does not cover:

   (a) Sublimed sulphur, precipitated sulphur or colloidal sulphur (Recommended Item 28.02);

* (b) Natural ferrous earth colours containing 70% or more by weight of combined iron evaluated as Fe_2O_3 (Recommended Item 28.23);

   (c) Pharmaceutical products;

   (d) - deleted;

   (e) - deleted;

   (f) Precious or semi-precious stones;

   (g) Cultured sodium chloride crystals (other than optical elements) weighing not less than 2.5 g each, of Recommended Item 38.19; optical elements of sodium chloride;

   (h) - deleted;

** (Additional Exclusions)

   (i) Flavoured salt such as celery salt;

   (j) Iron ores; or

   (k) Products for use exclusively as disinfectants, insecticides, fungicides, herbicides, anti-sprouting products, rodenticides or otherwise in combatting pests of a plant or animal nature (Recommended Item 38.11).

Explanatory Notes

As provided in Note 1, these Recommended Items cover mineral products in the crude state or washed (including washing with chemical substances to eliminate impurities provided that the structure of the product itself is not changed), crushed, ground, powdered, levigated, sifted, screened or concentrated by flotation, magnetic separation and other mechanical or physical processes (not including crystallisation). Minerals which have been otherwise processed (e.g., purified by recrystallisation, made up into articles by shaping, carving, etc.) generally fall elsewhere in Schedule "A" (for example, in Chapter 28 or outside this Section).

* These Recommended Items, by their wording, cover goods in addition to those covered by Chapter Note 1 in that:

(1) Recommended Items 25.01 and 25.03 refer to goods which by their nature must have been subjected to a process not provided for by Note 1 to this Chapter, namely: pure sodium chloride (Recommended Item 25.01) and certain forms of refined sulphur (Recommended Item 25.03); and

(2) Recommended Item 25.09 specifies a condition and a process which are admissible in addition to those allowed generally under Note 1 to this Chapter in that it covers earth colours whether or not calcined or mixed together.

** Notwithstanding Chapter Note 2 (d), Recommended Item 25.09 is applicable to natural micaceous iron oxides, mainly used as anti-rust pigments, even though they naturally contain more than 70 per cent by weight of combined iron.

The Chapter excludes precious stones.

Explanation of Changes

It will be noted that as these Notes apply only to three recommended items, whereas Chapter 25 in the Brussels Nomenclature has 32 headings, the title of the Chapter has been changed. This is also the reason for the deletion of exclusions (d), (e) and (h) from Chapter Note 2, as they are not relevant to these three recommended items and accounts for the re-wording of the second paragraph of the Explanatory Notes.

The word "natural" added to Note 2 (b) and the additional exclusions are all derived from the Explanatory Notes and are included either for clarity or to offset Section or Chapter Notes not available to us.

The third paragraph of the Explanatory Notes is added for clarity and is derived from the Explanatory Notes to heading 25.09.

CHAPTER 28

INORGANIC CHEMICALS; ORGANIC AND INORGANIC COMPOUNDS OF PRECIOUS METALS, OF RARE EARTH METALS, OF RADIO-ACTIVE ELEMENTS AND OF ISOTOPES

Chapter Notes.

1. - Except where the context otherwise requires, the items of this Chapter are to be taken to apply only to:

   (a) Separate chemical elements and separate chemically defined compounds, whether or not containing impurities;

   (b) Products mentioned in (a) above dissolved in water;

   (c) Products mentioned in (a) above dissolved in other solvents provided that the solution constitutes a normal and necessary method of putting up these products adopted solely for reasons of safety or for transport and that the solvent does not render the product particularly suitable for some types of use rather than for general use;

   (d) The products mentioned in (a), (b), or (c) above with an added stabiliser necessary for their preservation or transport.

2. - In addition to dithionites stabilised with organic substances and to sulphoxylates (Recommended Item 28.36), carbonates and percarbonates of inorganic bases (Recommended Item 28.42), cyanides and complex cyanides of inorganic bases (Recommended Item 28.43), fulminates, cyanates and thiocyanates, of inorganic bases (Recommended Item 28.44), organic products included in Recommended Items 28.49 to 28.52 and metallic and mon-metallic carbides (Recommended Item 28.56), only the following compounds of carbon are also to be classified in the present Chapter:

   (a) Oxides of carbon; hydrocyanic, fulminic, isocyanic, thiocyanic and other simple or complex cyanogen acids (Recommended Item 28.13);

   (b) Oxyhalides of carbon (Recommended Item 28.14);

   (c) Carbon disulphide (Recommended Item 28.15);

   (d) Thiocarbonates, selenocarbonates, tellurocarbonates, selenocyanates, tellurocyanates, tetrathiocyanatodiamminochromates (reineckates) and other complex cyanates, of inorganic bases (Recommended Item 28.48);

* (e) Solid hydrogen peroxide <u>or urea peroxide</u> (Recommended Item 28.54), carbon oxysulphide, thiocarbonyl halides, cyanogen, cyanogen halides and cyanamide and its metallic derivatives (Recommended Item 28.58) other than calcium cyanamide (<u>cyanamid, lime nitrogen</u>) containing, in the dry state, not more than 25 per cent by weight of nitrogen <u>whether or not treated with oil</u> (Recommended Item 31.00).

3. - This Chapter does not cover:

(a) Sodium chloride or other mineral products, <u>including ores of metals</u>.

** (i) This exclusion applies to uncalcined mineral products which are in the crude state, or which have been washed (even with chemical substances eliminating the impurities without changing the structure of the product), crushed, ground, powdered, levigated, sifted, screened, concentrated by flotation, magnetic separation or other mechanical or physical processes (not including crystallisation).

In addition, certain mineral products, further processed than as described above, are excluded from Chapter 28. These include goods provided for elsewhere in Schedule "A" and in Recommended Items R-7, R-38, 25.01, 25.03 and 25.09. Without limiting the generality of the foregoing, the mineral products listed below are excluded from Chapter 28: calcined clay; calcined infusorial earths, siliceous fossil meals and similar siliceous earths; calcined dolomite; magnesium oxide (howsoever produced) less than 94 per cent pure; quicklime and slaked lime; calcined crude natural borates and concentrates thereof; calcined strontianite.

(ii) For the purpose of this exclusion, the term "ores of metals", means minerals of mineralogical species actually used in the metallurgical industry for the extraction of precious metals or base metals, of mercury or of the metals of Recommended Item 28.50, even if they are intended for non-metallurgical purposes.

Processes to which metallic ores may have been submitted without changing their status as ores, include physical, physico-chemical or chemical operations, provided that they are normal to the preparation of the ores for the extraction of the metal. With the exception of the changes resulting from calcination, roasting or firing (with or

without agglomeration), such operations must not alter the chemical composition of the basic compound which furnishes the desired metal. However more or less pure products obtained by repeated physical changes (fractional crystallisation, sublimation, etc.), even if there has been no change in the chemical composition of the basic ore,may be classified in Chapter 28.

(b) Organo-inorganic compounds other than those mentioned in Note 2 above;

* (c) Products covered by Recommended Item 31.00;

(d) Inorganic products of a kind used as luminophores (Recommended Item 32.07);

(e) Artificial graphite; products put up as charges for fire-extinguishers or put up in fire-extinguishing grenades; ink removers put up in packings for sale by retail, of Recommended Item 38.19; cultured crystals (other than optical elements) weighing not less than 2.5 g each, of magnesium oxide or of the halides of the alkali or of the alkaline-earth metals, of Recommended Item 38.19;

(f) Precious or semi-precious stones (natural, synthetic or reconstructed) or dust or powder of such stones, and precious metals;

(g) Base metals, whether or not chemically pure;

(h) Optical elements, for example, of magnesium oxide or of the halides of the alkali or of the alkaline-earth metals;

(Additional exclusions)

(i) Products suitable for therapeutic or prophylactic uses, put up in measured doses or in packings of a kind sold by retail; or

(j) Disinfectants, insecticides, etc., as described in Recommended Item 38.11.

4. - Chemically defined complex acids consisting of a non-metal acid falling within Recommended Items 28.06 to 28.13 inclusive and a metallic acid falling within Recommended Items 28.16 to 28.28 inclusive are to be classified in Recommended Item 28.13.

5. - Recommended Items 28.29 to 28.48 inclusive are to be taken to apply only to metallic or ammonium salts or peroxysalts.

Except where the context otherwise requires, double or complex salts are to be classified in Recommended Item 28.48.

6. - Recommended Item 28.50 is to be taken to apply only to:

(a) The following fissile chemical elements and isotopes: natural uranium and uranium isotopes 233 and 235, plutonium and plutonium isotopes;

(b) The following radio-active chemical elements: technetium, promethium, polonium, astatine, radon, francium, radium, actinium, protactinium, neptunium, americium and other elements of higher atomic number;

(c) All other radio-active isotopes, natural or artificial, including those of precious metals and of base metals;

(d) Compounds, inorganic or organic, of these elements or isotopes, whether or not chemically defined and whether or not mixed together;

(e) Alloys (other than ferro-uranium), dispersions and cermets, containing any of these elements or isotopes or their inorganic or organic compounds;

(f) Nuclear reactor cartridges, spént or irradiated.

The term "isotopes" mentioned above and in Recommended Items 28.50 and 28.51 includes "enriched isotopes", but does not include chemical elements which occur in nature as pure isotopes nor uranium depleted in U 235.

7. - Recommended Item 28.55 is to be taken to include ferro-phosphorus containing 15 per cent or more by weight of phosphorus and phosphor copper containing more than 8 per cent by weight of phosphorus.

Explanatory Notes

As a general rule, Chapter 28 is limited to separate chemical elements and separate chemically defined inorganic compounds.

(A) Chemically defined elements and compounds.

(Chapter Note 1)

Separate chemical elements and separate chemically defined compounds containing impurities, or dissolved in water, remain classified in Chapter 28.

Such elements and compounds are excluded from Chapter 28 when they are dissolved in solvents other than water, unless the solution constitutes a normal and necessary method of putting up these products adopted solely for reasons of safety or for transport (in which case the solvent must not render the

product particularly suitable for some types of use rather than for general use). Thus, carbon oxychloride dissolved in benzene, alcoholic solutions of ammonia and colloidal solutions of aluminum hydroxide are excluded from the present Chapter and fall to be classified in Recommended Item 38.19.

Separate chemically defined elements and compounds as described above, put up with an added stabiliser necessary for their preservation or transport, remain classified in the present Chapter. For example, hydrogen peroxide stabilised by addition of boric acid remains classified in Recommended Item 28.54; but sodium peroxide mixed with catalysts (for production of hydrogen peroxide) is excluded from Chapter 28 and is classified in Recommended Item 38.19.

(B) Distinction between the compounds of Chapter 28 and those of Chapter 29.

(Chapter Note 2)

The following is an exhaustive list of the carbon compounds falling within Chapter 28:

Recommended Item 28.13 - Oxides of Carbon

Hydrocyanic, hydroferrocyanic and hydroferricyanic acids.

Isocyanic, fulminic, thiocyanic, cyanomolybdic and other simple or complex cyanogen acids.

Recommended Item 28.14 - Oxyhalides of carbon.

Recommended Item 28.15 - Carbon disulphide.

Recommended Item 28.36 - Metallic dithionites stabilised with organic substances. Sulphoxylates.

Recommended Item 28.42 - Carbonates and percarbonates, of inorganic bases.

Recommended Item 28.43 - Cyanides of inorganic bases.

Complex cyanides (ferrocyanides, ferricyanides, nitroferrocyanides, nitroferricyanides, cyanomanganates, cyanocadmates, cyanochromates, cyanocobaltates, cyanonickelates, cyanocuprates, cyanomercurates, etc.), of inorganic bases.

Recommended Item 28.44 - Fulminates, cyanates and thiocyanates, of inorganic bases.

Recommended Item 28.48 - Thiocarbonates, selenocarbonates, tellurocarbonates, selenocyanates, tellurocyanates, tetrathiocyanatodiamminochromates (reineckates) and other double or complex cyanates, of inorganic bases.

Recommended Items 28.49 to 28.52 - Inorganic and organic compounds of:
- (i) Precious metals.
- (ii) Radio-active elements.
- (iii) Isotopes.
- (iv) Thorium, uranium depleted in U 235, rare earth metals, yttrium or scandium.

Recommended Item 28.54 - Solid hydrogen peroxide (hydrogen peroxide combined with urea), whether or not stabilised.

Recommended Item 28.56 - Carbides and complex carbides (borocarbides, carbonitrides, etc.), other than hydrogen carbides (hydrocarbons).

Recommended Item 28.58 - Carbon oxysulphide.
Thiocarbonyl halides.
Cyanogen and halogen compounds of cyanogen.
Cyanamide and metallic derivatives of cyanamide (other than calcium cyanamide containing, in the dry state, not more than 25 per cent by weight of nitrogen, whether or not treated with oil, - see Recommended Item 31.00).

All other carbon compounds are excluded from Chapter 28.

(C) Products which remain classified in Chapter 28, even when they are not separate chemical elements nor separate chemically defined compounds.

There are certain exceptions to the rule that Chapter 28 is limited to separate chemical elements and separate chemically defined compounds. These exceptions include the following products:

Recommended Item 28.02 - Colloidal sulphur.

Recommended Item 28.03 - Carbon blacks.

Recommended Item 28.08 - Oleum.

Recommended Item 28.09 - Sulphonitric acids.

Recommended Item 28.15 - Phosphorus trisulphide.

Recommended Item 28.23 - Earth colours containing 70 per cent or more by weight of combined iron evaluated as Fe_2O_3.

Recommended Item 28.27 - Red lead and orange lead.

Recommended Item 28.35 - Polysulphides.

Recommended Item 28.36 - Dithionites stabilised with organic substances.

Recommended Item 28.42 - Commercial ammonium carbonate containing ammonium carbamate.

Recommended Item 28.45 - Commercial sodium and potassium silicates.

Recommended Item 28.49 - Colloidal precious metals. Amalgams of precious metals.

Recommended Items 28.49 to 28.51 - Non-chemically defined inorganic or organic compounds of

(i) Precious metals.
(ii) Radio-active elements.
(iii) Isotopes.

Recommended Item 28.52 - Intermixtures of inorganic or organic compounds of thorium, of uranium depleted in U 235, of rare earth metals, of yttrium or of scandium.

Recommended Item 28.53 - Liquid air and compressed air.

Recommended Item 28.58 - Amalgams (other than amalgams of precious metals, - see under Recommended Item 28.49 above).

(D) Exclusion from Chapter 28 of certain separate chemical elements and of certain separate chemically defined inorganic compounds.

(Chapter Note 3)

Certain separate chemical elements and certain separate chemically defined inorganic compounds are always excluded from Chapter 28, even when they are chemically pure.

Examples are:

* (1) Mineral products as described in Chapter Note 3 (a).

(2) Certain inorganic salts of Recommended Item 31.00 (viz: ammonium nitrate, ammonium sulphonitrate, ammonium sulphate and calcium nitrate-magnesium nitrate; also potassium chloride, though this may in certain cases fall in Recommended Item 38.19 or other item of Schedule "A").

(3) Artificial graphite.

(4) Precious or semi-precious stones (natural, synthetic or reconstructed, and dust or powder of such stones).

(5) Precious metals and base metals.

Certain other separate elements or separate chemically defined compounds, which would otherwise have been classified in Chapter 28, may be excluded, <u>if for certain uses</u>, or when put up in certain forms, or if they have been subjected to certain treatments which leave their chemical composition unchanged.#

Examples are:

(a) Products suitable for therapeutic or prophylactic uses, put up in measured doses or in packings of a kind sold by retail for such uses.

(b) Products of a kind used as luminophores (e.g., calcium tungstate) which have been treated to render them luminescent (Recommended Item 32.07).

(c) - deleted

(d) - deleted

(e) Photographic products (e.g., sodium thiosulphate), put up in measured portions or put up for sale by retail in a form ready for photographic use (Recommended Item 37.08).

(f) Disinfectants, insecticides, etc., as described in Recommended Item 38.11.

(g) Products (e.g., sulphuric acid) put up as charges for fire-extinguishers (Recommended Item 38.17) or put up in fire-extinguishing grenades.

(h) Ink removers put up in packings for sale by retail (Recommended Item 38.19).

\# These exclusions do not affect the products classifiable in Recommended Items 28.49 to 28.52 (See Section Notes 1 and 2).

(ij) Magnesium oxide or halides of the alkali or of the alkaline-earth metals (e.g., lithium fluoride, calcium fluoride, potassium bromide, potassium bromoiodide, etc.), in the form of optical elements or of cultured crystals weighing not less than 2.5 g each.

(E) Products potentially classifiable in two or more Recommended Items of Chapter 28.

Section Note #1 deals with the problems of products potentially classifiable:

(a) In Recommended Item 28.50 or 28.51, and also in some other Recommended Item of Chapter 28.

(b) In Recommended Item 28.49 or 28.52, and also in some other Recommended Item of Chapter 28 (other than Recommended Item 28.50 or 28.51).

* Chemically defined complex acids consisting of a non-metal acid (falling within Recommended Items 28.06 to 28.13 inclusive) and a metallic acid (falling within Recommended Items 28.16 to 28.28 inclusive) are classified in Recommended Item 28.13 (see Note 4 to Chapter 28).

* Except where the context otherwise requires, double or complex inorganic salts are to be classified in Recommended Item 28.48 (see Note 5 to Chapter 28).

Explanation of Changes

The wording of Chapter Note 2 (e) has been altered to conform to that used in the Recommended Schedule. Chapter Note 3 (a) has been expanded to offset the lack of most of the headings of Chapter 25 of the Brussels Nomenclature and of Chapter 26 with its notes.

Additional Notes 3 (i) and (j) are taken from the Explanatory Notes to offset lack of appropriate reference elsewhere.

In the Explanatory Notes there are certain consequential changes. Two examples of products excluded in countries using the full Brussels Nomenclature have been deleted - i.e. single defined chemicals put up in packings of a kind sold by retail for use as perfumery, cosmetics or toilet preparations, or for use as glues; these products will be classified in the appropriate recommended items of Chapter 28.

In the last two paragraphs of the Explanatory Notes, references have been deleted to Explanatory Notes for particular headings as these Notes have not yet been adapted for use with the Recommended Schedule.

CHAPTER 29

ORGANIC CHEMICALS

Chapter Notes

1. Except where the context otherwise requires, the Recommended Items of this Chapter are to be taken to apply only to:

   (a) Separate chemically defined organic compounds, whether or not containing impurities;

** (b) Mixtures of two or more isomers of the same organic compound (whether or not containing impurities) having the same chemical function (or functions), provided that these isomers either co-exist in their natural form or are obtained simultaneously in the course of the same synthesis, except that mixtures of acyclic hydrocarbon isomers (other than stereoisomers), whether or not saturated, are excluded;

   (c) The products of Recommended Items 29.38 to 29.42 inclusive, or the sugar ethers and sugar esters, and their salts, of Recommended Item 29.43, or the products of Recommended Item 29.44, whether or not chemically defined;

   (d) Products mentioned in (a), (b) or (c) above dissolved in water;

   (e) Products mentioned in (a), (b) or (c) above dissolved in other solvents provided that the solution constitutes a normal and necessary method of putting up these products adopted solely for reasons of safety or for transport and that the solvent does not render the product particularly suitable for some types of use rather than for general use;

   (f) The products mentioned in (a), (b), (c), (d) or (e) above with an added stabilizer necessary for their preservation or transport;

   (g) Diazonium salts, arylides used as couplers for these salts, and fast bases for azoic dyes, diluted to standard strengths.

2. This Chapter does not cover:

* (a) Glycerol (Recommended Item 15.11), or fats and oils, of fish and marine mammals, whether or not refined;

   (b) Ethyl alcohol;

(c) Methane;

(d) The compounds of carbon mentioned in Note 2 of Chapter 28;

(e) Urea containing not more than 45 per cent by weight of nitrogen, calculated on the dry anhydrous product (Recommended Item 31.00(2));

(f) Colouring matter of vegetable or animal origin (Recommended Item 32.04); synthetic organic dyestuffs (including pigment dyestuffs), synthetic organic products of a kind used as luminophores and products of the kind known as optical bleaching agents substantive to the fibre and natural indigo (Recommended Item 32.05) and dyes put up in forms or packings of a kind sold by retail (Recommended Item 32.09);

(g) Metaldehyde and hexamethylenetetramine put up in forms (for example, tablets, sticks or similar forms) for use as fuels (Recommended Item R-40) and liquid fuels of a kind used in mechanical lighters in containers of a capacity not exceeding 300 cm3;

(h) Products put up as charges for fire-extinguishers (Recommended Item 38.17) or put up in fire-extinguishing grenades; ink removers and stencil correctors put up in packings for sale by retail, of Recommended Item 38.19;

(i) Optical elements, for example, of ethylenediamine tartrate.

** (Additional exclusions)

(j) Sucrose and glucose, even when chemically pure;

(k) Products suitable for therapeutic or prophylactic uses, put up in measured doses or in packings of a kind sold by retail for such uses; or

(l) Disinfectants, insecticides, etc., as described in Recommended Item 38.11.

3. Goods which could be included in two or more of the Recommended Items of this Chapter are to be classified in the latest of those Recommended Items.

4. In Recommended Items 29.03 to 29.05, 29.07 to 29.10 and 29.12 to 29.21 inclusive, any reference to halogenated, sulphonated, nitrated or nitrosated derivatives is to be taken to include a reference to any combinations of these derivatives (for example, sulphohalogenated, nitrohalogenated, nitrosulphonated and nitrosulphohalogenated derivatives).

Nitro and nitroso groups are not to be taken as nitrogen-functions for the purpose of Recommended Item 29.30.

(Additional paragraph)

** Recommended Items 29.14, 29.15 and 29.16 cover the carboxylic acids which contain the characteristic function, called the carboxyl group. These Recommended Items also cover the ortho-acids, which, however, do not exist in the free state, but do give rise to stable esters (ortho-esters). The sulphonic acid group is not to be taken as an acid function for the purposes of these Recommended Items.

5. (a) The esters of acid-function organic compounds falling within Recommended Items 29.01 to 29.16 inclusive, with organic compounds of these Recommended Items are to be classified with that compound which is classified in the Recommended Item placed last in the above-mentioned group of Recommended Items.

   (b) Esters of ethyl alcohol or glycerol with acid-function organic compounds of Recommended Items 29.01 to 29.16 inclusive, are to be classified with the corresponding acid-function compounds.

   (c) The salts of the esters referred to in paragraph (a) or (b) above with inorganic bases are to be classified with the corresponding esters.

   (d) The salts of other acid- or phenol-function organic compounds falling within Recommended Items 29.01 to 29.16 inclusive, with inorganic bases are to be classified with the corresponding acid- or phenol-function organic compounds.

   (e) Halides of carboxylic acids are to be classified with the corresponding acids.

(Additional paragraph)

** Subject to Chapter Note 8, with the exception of the sub-items numbered (1) and those providing for essential oils of the Recommended Items 29.01 to 29.16 inclusive, the esters, salts and halides referred to above are not to be classified in any sub-item unless specifically named therein.

6. The compounds of Recommended Items 29.31 to 29.34 are organic compounds the molecules of which contain, in addition to atoms of hydrogen, oxygen or nitrogen, atoms of other non-metals or of metals (such as sulphur, arsenic, mercury or lead) directly linked to carbon atoms.

Recommended Item 29.31 (organo-sulphur compounds) and Recommended Item 29.34 (other organo-inorganic compounds) are to be taken not to include sulphonated or halogenated derivatives (including compound derivatives) which, apart from hydrogen, oxygen and nitrogen, only have directly linked to carbon the atoms of sulphur and of halogens which give them their nature of sulphonated or halogenated derivatives (or compound derivatives).

7. Recommended Item 29.35 (heterocyclic compounds) is to be taken not to include internal ethers, internal hemiacetals, methylene ethers of orthodihydric phenols, epoxides with three or four member rings, cyclic acetals, cyclic polymers of aldehydes, of thioaldehydes or of aldimines, anhydrides of polybasic acids, cyclic esters of polyhydric alcohols with polybasic acids, cyclic ureides, imides of polybasic acids, hexamethylenetetramine and trimethylenetrinitramine.

(Additional paragraph)

** For purposes of this note, the term "internal ether" does not include the following heterocyclic compounds:

(i) Five membered rings containing one hetero-atom of oxygen - furan group.

(ii) Six membered rings containing one hetero-atom of oxygen - pyran group.

** (Additional Notes)

8. Subject to the prescribed exceptions from the requirements that this Chapter applies only to separate chemically defined compounds, where, in the Recommended Items of this Chapter,

(a) a name describes a single isomer, it is taken to apply only to that isomer;

(b) a name, in either the singular or plural number, describes a group of isomers of the same organic compound, the name is taken to apply to each individual isomer and, subject to Note 1(b), to mixtures of such isomers;

(c) a name, in either the singular or plural number, describes a group of more than one separate chemically defined compounds, the members of which are not related to each other as isomers, the name is taken to apply to each member of such group individually and not to mixtures, however produced, of such members.

In the case of two or more isomers of the same organic compound having the same chemical function or functions falling within a group as described in paragraph (c), the tariff provision is taken to apply to each isomer of the said compound and, subject to Note 1(b), to mixtures of such isomers.

9. Products of Chapter 29 are to be classified in the relevant sub-items providing for natural or synthetic essential oils only when they are:

   (a) volatile oils derived from plants; or

   (b) chemicals, in liquid form, which are volatile oils and used for flavouring or perfuming purposes.

Explanatory Notes

As a general rule, the present Chapter is normally restricted to separate chemically defined compounds.

(A) Chemically defined compounds.

(Chapter Note 1)

The separate chemically defined compounds falling within the present Chapter may contain impurities or be dissolved in water. Subject to the same qualifications as those set out in the General Explanatory Note on Chapter 28, the present Chapter also includes non-aqueous solutions and also compounds (or their solutions) with added stabilisers. For example, styrene inhibited with tertiary butylcathechol remains classified in Recommended Item 29.01.

This Chapter further includes, whether or not they contain impurities, mixtures of isomers of the same organic compound having the same chemical function (or functions), provided that these isomers either co-exist in their natural form or are obtained simultaneously in the course of the same synthesis. Mixtures of acyclic hydrocarbon isomers (other than stereo-isomers), whether or not saturated, are, however, excluded.

(B) Distinction between the compounds of Chapter 28 and those of Chapter 29.

See Part (B) of the General Explanatory Note on Chapter 28.

Organo-inorganic compounds, other than those listed in Note 2 to Chapter 28, fall within Chapter 29.

(C) Products which remain classified in Chapter 29, even when they are not separate chemically defined compounds.

There are certain exceptions to the rule that Chapter 29 is limited to separate chemically defined compounds. These exceptions include the products falling within the following Recommended Items:

Recommended Item 29.24 - Lecithins and other phosphoaminolipins.
Recommended Item 29.35 - Nucleic acids.
Recommended Item 29.38 - Provitamins and vitamins (including concentrates and intermixtures), whether or not in a solvent.
Recommended Item 29.39 - Hormones.
Recommended Item 29.40 - Enzymes.
Recommended Item 29.41 - Glycosides and their derivatives.
Recommended Item 29.42 - Vegetable alkaloids and their derivatives.
Recommended Item 29.43 - Sugar ethers and sugar esters, and their salts.
Recommended Item 29.44 - Antibiotics.

The present Chapter also includes diazonium salts (Recommended Item 29.28), arylides used as couplers for these salts, and fast bases for azoic dyes, diluted to standard strengths. (These are dyeing industry products to which, for example, ** neutral salts (such as sodium benzene sulphonate) have been added).

(D) Exclusion from Chapter 29 of certain separate chemically defined organic compounds.

(Chapter Note 2)

(1) Certain separate chemically defined organic compounds are always excluded from Chapter 29, even when they are chemically pure. In addition to those which fall in Chapter 28 (see Part (B) of the General Explanatory Note to that Chapter), examples of compounds of this group are:

(a) Glycerol (Recommended Item 15.11).
(b) Sucrose and glucose.
(c) Ethyl alcohol (Recommended Item R-3)
(d) Methane.
(e) Urea containing not more than 45 per cent by weight of nitrogen, calculated on the anhydrous product (Recommended Item 31.00(2)).
(f) Colouring matter of animal or vegetable origin (e.g., chlorophyll) (Recommended Item 32.04).
(g) Synthetic organic dyestuffs (including pigment dyestuffs), and products of the kind known as optical bleaching agents, substantive to the fibre (e.g., certain stilbene derivatives) (Recommended Item 32.05).

** (2) Certain other separate chemically defined organic products, which would otherwise have been classified in Chapter 29, may be excluded, <u>if for certain uses</u>, or when put up in certain forms, or if they have been subjected to certain treatments which leave their chemical composition unchanged. Examples are:

(a) Products suitable for therapeutic or prophylactic uses, put up in measured doses or in packings of a kind sold by retail for such uses.

(b) Products of a kind used as luminophores (e.g., salicylaldazine) which have been treated to render them luminescent (Recommended Item 32.05).

(c) Dyes put up in forms or packings of a kind sold by retail for such use (Recommended Item 32.09).

(d) - deleted

(e) - deleted

(f) Metaldehyde and hexamethylenetetramine put up in forms for use as fuels (Recommended Item R-40), and liquid fuels (e.g., liquid butane) of a kind used in mechanical lighters, put up in containers of a capacity not exceeding 300 cm^3.

(g) Photographic products (e.g., quinol), put up in measured portions or put up for sale by retail in a form ready for photographic use (Recommended Item 37.08).

* (h) Disinfectants, insecticides, etc. (e.g., paradichlorobenzene), as described in Recommended Item 38.11.

(ij) Products (e.g., carbon tetrachloride) put up as charges for fire-extinguishers (Recommended Item 38.17) or put up in fire-extinguishing grenades.

(k) Ink removers (e.g., chloramines of Recommended Item 29.36 dissolved in water) put up in packings for sale by retail (Recommended Item 38.19).

(l) Stencil correctors put up in packings for sale by retail (Recommended Item 38.19).

(m) Optical elements (e.g., ethylenediamine tartrate).

(E) Products potentially classifiable in two or more headings of Chapter 29.

(Chapter Note 3)

Such products are to be classified in the latest of the Recommended Items which could be applied. For example, carotenes could be regarded as hydrocarbons (Recommended Item 29.01) or as provitamins (Recommended Item 29.38); they must therefore be classified in Recommended Item 29.38.

It should, however, be noted that, as an exception to this general rule, the last phrase of the text of Recommended Item 29.43 specifically excludes the products of Recommended Items 29.39, 29.41 and 29.42.

(F) Halogenated, sulphonated, nitrated or nitrosated derivatives and combinations thereof.

(Chapter Note 4)

Certain Recommended Items of Chapter 29 include references to the halogenated, sulphonated, nitrated and nitrosated derivatives. Such references are to be taken to include any combinations of these derivatives, for example, sulphohalogenated, nitrohalogenated, nitrosulphonated, nitrosulphohalogenated, etc., derivatives.

Nitro and nitroso groups are not to be taken as nitrogen-functions for the purpose of Recommended Item 29.30.

** Recommended Items 29.14, 29.15 and 29.16 cover the carboxylic acids which contain the characteristic function (-COOH), the carboxyl group. These Recommended Items also cover the ortho-acids ($R.C(OH)_3$), which, however, do not exist in the free state, but do give rise to stable esters (ortho-esters). The sulphonic acid group ($-SO_3H$) is not to be taken as an acid function for the purposes of Recommended Items 29.14, 29.15 and 29.16. This does not affect the classification in these Recommended Items of the sulphonated derivatives of the acid-function compounds properly classified in these Recommended Items.

(G) Classification of esters, salts and certain halides.

(Chapter Note 5)

(1) Esters.

The esters of acid-function organic compounds falling within Recommended Items 29.01 to 29.16 inclusive with organic compounds of these Recommended Items are to be classified with that compound which is classified in the Recommended Item placed last in the above-mentioned group of Recommended Items.

Examples:

(a) Diethylene glycol acetate (ester formed by the reaction of acetic acid of Recommended Item 29.14 with diethylene glycol of Recommended Item 29.08)........................ Recommended Item 29.14

(b) Methyl benzenesulphonate (ester formed by the reaction of benzenesulphonic acid of Recommended Item 29.03 with methyl alcohol of Recommended Item 29.04)................... Recommended Item 29.04

(c) Butyl phthalyl butyl glycollate (ester formed by the reaction of phthalic acid of Recommended Item 29.15 and glycollic acid of Recommended Item 29.16 with butyl alcohol of Recommended Item 29.04)................... Recommended Item 29.16

This rule cannot be applied to the esters of such acid-function compounds with ethyl alcohol or glycerol since these compounds are not classified in Chapter 29. Such esters are to be classified with the acid-function compounds from which they are derived.

Example:

Glycerol acetate (ester formed by the reaction of acetic acid of Recommended Item 29.14 with glycerol)..................... Recommended Item 29.14

It should further be noted that sugar esters and their salts are classified in Recommended Item 29.43.

(2) Salts of inorganic bases.

These salts may be formed by the reaction of inorganic bases either:

(a) With the esters referred to above; such salts are classified with the corresponding esters.

Example:

n-Butyl copper phthalate (salt formed by the reaction of n-butyl hydrogen phthalate of Recommended Item 29.15 with copper hydroxide)............. Recommended Item 29.15

or (b) with other acid- or phenol-function organic compounds of Recommended Items 29.01 to 29.16 inclusive; such salts are classified with the corresponding acid- or phenol-function organic compounds.

Example:

Sodium methoxybenzoate (salt formed by the reaction of methoxybenzoic acid of Recommended Item 29.16 with sodium hydroxide).................... Recommended Item 29.16

(3) Halides of carboxylic acids.

Such halides are classified with the corresponding acids. For example, isobutyryl chloride is classified (like the isobutyric acid to which it corresponds) in Recommended Item 29.14.

** Subject to Chapter Note 8, with the exception of the sub-items numbered (1) and those providing for essential oils of the Recommended Items 29.01 to 29.16 inclusive, the esters, salts and halides referred to above are not to be classified in any sub-item unless specifically named therein.

For example, acrylic acid is in Recommended Item 29.14(5) whereas its ester, n-butyl acrylate, is classified in 29.14(1), and ethyl acrylate is classified in 29.14(32).

** (H) SUB-ITEM NAMES

(Chapter Note 8)

With certain stated exceptions, (see General Explanatory Note of Chapter 29, Section (C)), the chemical names appearing in the sub-items of this Chapter are taken to refer to separate chemically defined compounds. These names, however, are not uniform in scope of application and in this regard, may be categorized as follows:

(i) A name which describes a unique chemical compound without possibility of isomerism such as is described in Chapter Note 1(b).

Examples:

29.01(11)	Ethylene
29.04(5)	Ethylene glycol
29.06(11)	Phenol
29.14(33)	Formic acid

(ii) A name which describes a single group of isomers, within the meaning of Chapter Note 1(b). The name applies to any member, or any mixture of members, of the group.

Examples:

29.01(22)	Xylenes
29.04(11)	Octanols
29.06(10)	Nonyl phenol

(iii) A name which describes a single isomer within a group. The name applies only to that isomer. (See Chapter Note 8(a)).

Examples:

29.07(2)	2,4-Dichlorophenol
29.14(15)	n-butyl acetate
29.15(16)	Di(2-ethylhexyl) phthalate

(iv) A name which describes a group of non-isomeric separate chemically defined compounds. The name applies to each member of the group individually, not to mixtures of the members. (See Chapter Note 8(c)).

Examples:

29.02(4)	Chlorofluoromethanes
29.19(5)	Ethyl acid phosphates
29.23(4)	Ethanolamines

(v) A name which describes a group of separate chemically defined compounds, each member of which may be described in terms of paragraph (ii), i.e., it constitutes a group of isomers within the meaning of Chapter Note 1(b). The name applies to each group of isomers individually and each such group is treated as under paragraph (ii). The name does not apply to mixtures involving members from more than one of the groups of isomers.

Examples:

29.02(3)	Chlorofluoroethanes
29.19(2)	Amyl acid phosphates
29.24(2)	Alkylbenzyltrialkylammonium chlorides

Explanation of Changes

The Explanatory Note which accompanies Chapter Note 1(b) of the Brussels Nomenclature indicates a more limited isomer rule than is suggested by the Chapter Note itself. To prevent confusion, certain words from the Explanatory Notes, as underlined, have been added to the Chapter Note.

Exclusions (j), (k) and (l) have been added to Note 2 to offset Section or Chapter Notes not available to us.

A paragraph has been added to Chapter Note 4 to remove a possible source of confusion. It is understood that those responsible for the Brussels Nomenclature are considering amendments in this same area.

A paragraph has been added to Chapter Note 5 to deal with problems arising from the sub-divisions of the recommended items.

A paragraph has been added to Chapter Note 7 to resolve a conflict between the Note and the Explanatory Notes to heading 29.35.

Notes 8 and 9 have been added, with an Explanatory Note to accompany Note 8, to define the meanings of sub-divisions of the recommended items.

Other changes to the Chapter Notes arise only from the form of the Recommended Schedule or from the absence of certain parts of the Brussels Nomenclature.

Most of the changes in the Explanatory Notes arise from the changes in the Chapter Notes. In the last paragraph of Note (C) and the first paragraph of part (2) of Note (D), the underlined words have been added for clarity. In this latter, exclusions (d) and (e) have been deleted as, under the Recommended Schedule, products of Chapter 29 for use as perfumery, cosmetic or toilet preparations, or as glues, even when put up in packages for sale by retail, will remain classified in this Chapter.

CHAPTER 31

** FERTILIZERS AND CERTAIN ENUMERATED GOODS

** Chapter Notes.

1. Recommended Item 31.00(1) covers all formulated fertilizers and all goods for use as fertilizers.

2. Recommended Item 31.00(2) covers only those products specifically mentioned therein.

** Explanatory Notes

It will be noted that certain products named in Recommended Item 31.00(2) are classified therein only when meeting certain limitations. The following are therefore excluded from this sub-item:

(a) Ammonium phosphates containing, in the dry state, less than 6 mg of arsenic per kg, which are classified in Recommended Item 28.40;

(b) Calcium cyanamide (cyanamid, lime nitrogen) containing, in the dry state, more than 25 per cent by weight of nitrogen, which is classified in Recommended Item 28.58;

(c) Calcium hydrogen phosphate (calcium phosphate, dibasic) containing, in the dry state, less than 0.2 per cent by weight of fluorine, which is classified in Recommended Item 28.40;

(d) Calcium nitrate containing, in the dry state, more than 16 per cent by weight of nitrogen, which is classified in Recommended Item 28.39;

(e) Magnesium sulphate - potassium sulphate containing more than 30 per cent by weight of K_2O, which is classified in Recommended Item 28.48;

(f) Potassium chloride crystals weighing not less than $2\frac{1}{2}$ grammes each;

(g) Potassium sulphate containing, in the dry state, more than 52 per cent by weight of K_2O, which is classified in Recommended Item 28.38;

(h) Sodium nitrate containing, in the dry state, more than 16.3 per cent by weight of nitrogen, which is classified in Recommended Item 28.39;

(i) Urea containing, in the dry state, more than 45 per cent by weight of nitrogen, whether or not coated or prilled, which is classified in Recommended Item 29.25.

Explanation of Changes

As the Board has adopted a radically different structure for this item, derived from, but broader than, the headings of Chapter 31 of the Brussels Nomenclature, the Brussels Chapter Notes and Explanatory Notes are inapplicable. These Notes are intended as a replacement.

CHAPTER 32

TANNING AND DYEING EXTRACTS; TANNINS AND THEIR DERIVATIVES; DYES, COLOURS, PAINTS AND VARNISHES; PUTTY, FILLERS AND STOPPINGS; INKS

Chapter Notes.

1. This Chapter does not cover:

   (a) Separate chemically defined elements and compounds (except those falling within Recommended Item 32.04 or 32.05, inorganic products of a kind used as luminophores (Recommended Item 32.07), and also dyes in forms or packings of a kind sold by retail falling within Recommended Item 32.09); or

* (b) Tannates and other tannin derivatives of products falling within Recommended Items 29.38 to 29.42 and 29.44, or of albuminoidal substances such as casein, albumins, gelatin and other protein substances.

2. Recommended Item 32.05 is to be taken to include mixtures of stabilized diazonium salts and coupling compounds for the production of insoluble azoic dyestuffs on the fibre.

3. Recommended Items 32.05, 32.06 and 32.07 are to be taken to apply also to preparations based on, respectively, synthetic organic dyestuffs (including pigment dyestuffs), colour lakes and other colouring matter, of a kind used for colouring in the mass artificial plastics, rubber or similar materials, or as ingredients in preparations for printing textiles. The Recommended Items are not to be applied, however, to prepared pigments falling within Recommended Item 32.09.

4. Recommended Item 32.09 is to be taken to include solutions (other than collodions) consisting of any of the products specified in Recommended Items 39.01 to 39.06 in volatile organic solvents if, and only if, the weight of the solvent exceeds 50 per cent of the weight of the solution.

5. The expression "colouring matter" in this Chapter does not include products of a kind used as extenders in oil paints, whether or not they are also suitable for colouring distempers.

6. The expression "stamping foils" in Recommended Item 32.09 is to be taken to apply only to products of a kind used for printing, for example, book covers or hat bands, and consisting of:

(a) Thin sheets composed of metallic powder (including powder of precious metal), or pigment, agglomerated with glue, gelatin or other binder; or

(b) Metal (for example, gold or aluminum) or pigment, deposited on paper, artificial plastic material or other support.

(Additional Note)

** 7. Recommended Items 32.01 and 32.04 do not cover raw vegetable or animal materials, whether dried, shredded, powdered or not. Extracts of such raw vegetable materials are included in Recommended Item 32.01 when they are used mainly for the tanning of hides and skins. Extracts of such raw vegetable and animal materials, except litmus and prepared lichens, are included in Recommended Item 32.04 when they are used mainly as colouring substances.

Explanatory Notes

This Chapter covers preparations used in the tanning and bating of hides and skins (tanning extracts of vegetable origin, synthetic tanning substances, whether or not mixed with natural tanning materials, and artificial bates).

It also includes colouring matter of vegetable, animal or mineral origin and synthetic organic dyestuffs and most of the preparations obtained from these colouring matters (paints, ceramic colours, inks, etc.). Various other preparations such as varnishes, driers and putty are also included.

Except as regards the goods covered by Recommended Items 32.04 and 32.05, inorganic products of a kind used as luminophores (Recommended Item 32.07) and the dyes in forms or packings of a kind sold by retail (Recommended Item 32.09), products consisting of chemically defined elements or compounds are excluded from the present Chapter, and in general fall in Chapter 28 or 29.

** Chapter Note 7 defines the materials provided for in Recommended Items 32.01 and 32.04. Thus, Recommended Item 32.04 provides for colouring extracts from materials such as saffron, safflower, cochineal or kermes, but these goods in the raw state, or dried, shredded or powdered, are excluded. These Recommended Items do not cover extracts used, for example, for medicinal, flavouring or insecticidal purposes. Litmus and prepared lichens, being specifically provided for in Recommended Item R-6, are also excluded.

Explanation of Changes

The underlined wording in Chapter Note 1(b) has been substituted for a reference in the Brussels Nomenclature to headings not recommended for adoption.

Chapter Note 7 and an accompanying Explanatory Note have been added for clarity and to offset the lack of relevant headings and Notes elsewhere in the Brussels Nomenclature.

RECOMMENDED ITEM 34.02

ORGANIC SURFACE-ACTIVE AGENTS; SURFACE-ACTIVE PREPARATIONS AND WASHING PREPARATIONS, WHETHER OR NOT CONTAINING SOAP

Item Notes.

** 1. This Recommended Item covers:

(a) Organic surface-active agents, water-soluble (other than soaps). With other products, this includes:

(i) Water-soluble naphthenates and sulphonaphthenates;

(ii) Petroleum sulphonates of alkali metals, of ammonium or of ethanolamines, including those petroleum sulphonates containing a certain proportion of mineral oil;

(iii) Polyethers, other than synthetic waxes, having the character of organic surfactants, regardless of use.

(b) Surface-active preparations and washing preparations.

** 2. This Recommended Item does not cover:

(a) Separate chemically defined compounds;

(b) Natural products not mixed or prepared;

(c) Synthetic organic tanning substances (sometimes known as "syntans") (Recommended Item 32.03);

(d) Dentifrices, shaving creams or shampoos containing organic surface-active agents;

(e) Liquid soaps;

(f) Synthetic waxes (Recommended Item R-39); or

(g) Water-insoluble naphthenates and sulphonaphthenates, as well as petroleum sulphonates not cited in Note 1(a)(ii) above.

Explanatory Notes

This Recommended Item covers:

(I) Organic surface-active agents (other than soaps) consisting of single substances (not chemically defined), and also those standardised with the addition of inert materials such as sodium sulphate.

They are organic products of various kinds, which, when dissolved in small quantities in water, alter its surface tension to give solutions of lathering, wetting, penetrating and detergent or emulsifying power.

They include:

(1) Sulphoricinoleates and sulpho-oleates, <u>including sulphated and sulphonated fatty oils and their water-soluble salts</u>; sulpho-resinates; water-soluble naphthenates and sulphonaphthenates; petroleum sulphonates of alkali metals, of ammonium or of ethanolamines, including these petroleum sulphonates containing a certain proportion of mineral oil; sulphonation products of fatty alcohols, fatty esters, fatty acids and fatty amides; alkylsulphonates, alkylarylsulphonates, alkylsulphates and sulphonated derivatives of substituted benziminazoles and similar active anionic products.

(2) Salts of fatty amines, quaternary ammonium salts, and similar active cationic products.

(3) Products of the condensation of fatty alcohols, fatty acids, or alkylphenols with ethylene oxide, and similar non-ionic products.

(II) Surface-active preparations and washing preparations.

These preparations are mixtures and include:

(A) Surface-active preparations consisting of:

(1) Mixtures of the surface-active agents of paragraph (I) above (e.g., sulphoricinoleates mixed with sulphonated alkylnaphthalenes or sulphonated fatty alcohols).

(2) Solutions or emulsions of the surface-active agents of paragraph (I) above in an organic solvent (e.g., a solution of a sulphonated fatty alcohol in cyclohexanol or in tetrahydronaphthalene).

(3) Other mixtures with a basis of a surface-active agent of paragraph (I) above (e.g., surface-active preparations containing a proportion of soap).

(4) Solutions or emulsions of soap in an organic solvent such as cyclohexanol. (Solutions of soap in water, usually with the addition of a small quantity of ethyl alcohol, are liquid soaps falling elsewhere in Schedule "A").

R-39

SYNTHETIC WAX; WAXES CONTAINING SYNTHETIC WAX

** Item Notes.

1. This Recommended Item is taken to apply only to:

   (a) Synthetic waxes which are chemically-produced substitutes for natural waxes; and

   (b) Prepared waxes containing synthetic wax, not emulsified or containing solvents.

2. This Recommended Item does not cover:

   (a) Separate chemically defined compounds;

   (b) Hydrogenated oils such as hydrogenated castor oil, so-called "opal-wax"; or

   (c) Sealing wax.

Explanatory Notes

* (A) Synthetic Waxes

The expression "synthetic waxes" means substitutes for natural waxes, produced chemically but not having the character of separate chemically defined compounds.

They have, as a rule, the following properties:

(a) At 20°C (68° F):

   (i) They can be kneaded.

   (ii) Their consistency varies from hard to brittle.

   (iii) Their structure is crystalline or micro-crystalline.

   (iv) They are translucent to opaque, but not vitreous.

(b) At temperatures above 40° C (104° F), they melt without decomposing.

(c) Just above their melting points:

(B) Washing preparations consisting of:

(1) Inorganic products such as sodium carbonate, sodium metasilicate, sodium hexametaphosphate, peroxy salts (e.g., sodium perborate), sodium tetraborate, etc., mixed together.

(2) Mixtures with a basis of inorganic products (such as those referred to at (1) above), and containing also certain quantities of organic products (soaps, methylcellulose, pancreatic extracts, etc.).

The preparations referred to above are covered by the Recommended Item whether used for household or industrial purposes. They are used for clotheswashing; for washing and scouring (de-greasing) textiles to facilitate, for example, dyeing (dyeing adjuvants) or bleaching processes; for washing and de-greasing metal articles (kitchen utensils, appliances of various kinds, etc.); for washing tiles; for cleaning tanks, etc. Organic surface-active agents and preparations are also used for the preparation of insecticidal or pharmaceutical emulsions, and for
** fire-extinguishing preparations; <u>the classification of these is, however, subject to Section Note 3</u>.

Sheets, booklets and similar articles of paper or cellulose wadding, impregnated or coated with organic surface-active agents, of a kind used for washing the hands, are also included in this Recommended Item.

This Recommended Item does not cover:

(a) Water-insoluble naphthenates and sulphonaphthenates, as well as petroleum sulphonates not cited in paragraph (I)(1) above, which fall in Recommended Item 38.19, provided they are not preparations classified elsewhere;

(b) Shampoos.

<u>Explanation of Changes</u>

In the Brussels Nomenclature there are no such things as "Item Notes". As, however, this item has been picked out of its Chapter, such Notes have been prepared for it. They are based on the best information available, in the Chapter Notes, Explanatory Notes and the Compendium of Classification Opinions, as to the coverage of the heading and as to the products excluded therefrom.

The Explanatory Notes reproduce those of Brussels, with an addition, for clarity, in Note (I)(1) and an addition, to re-state the priority of end-use items, in the paragraph following Note (II) (B)(2).

(i) They are of relatively low viscosity.

(ii) They cannot be drawn into threads.

(d) Their consistency and solubility largely depend on the temperature.

(e) They take a polish when gently rubbed.

The <u>synthetic</u> waxes falling within the present Recommended Item include:

(1) Certain polychloronaphthalenes used mainly as non-inflammable insulating materials for electrical purposes.

(2) Soluble or emulsifiable waxes such as polyethylene glycol waxes and waxes consisting of glycerol monostearate and propylene glycol monostearate modified with small quantities of soap. These are used in the preparation of cosmetics, water colours, etc.

(3) Certain solid polychlorodiphenyls consisting of mixtures of chlorinated derivatives of diphenyl.

(4) Waxes composed of mixtures of fatty alcohols or of mixtures of esters of fatty alcohols.

(5) Waxes obtained by chemical modification (e.g., by modifying chemically carnauba wax or lignite wax).

(6) Certain solid chloroparaffins.

** The Item does not include hydrogenated oils such as hydrogenated castor oil (so-called "opal-wax") falling within Item 27700-1 (277).

(B) Waxes containing Synthetic Wax

** For the purposes of this Item, the expression "waxes containing synthetic wax" is to be taken to apply to mixtures which have the consistency of wax and contain synthetic wax.

Coloured waxes are classified as if they were uncoloured waxes.

The mixtures described above are classified under this item only when they are not emulsified and do not contain solvents (Item 25200-1) (252).

Explanation of Changes

Recommended Item R-39 has a relationship to heading 34.04 of the Brussels Nomenclature - "Artificial waxes (including water-soluble waxes); prepared waxes, not emulsified or containing solvents", on which these Notes have been based. The term "synthetic waxes" is taken to have the same meaning as "artificial waxes" except in so far as certain exclusions in Note 2 are concerned. Part (A) of the Explanatory Notes bears this out. Part (B) of the Explanatory Notes have been changed to relate only to the products mentioned in the latter part of the recommended item.

CHAPTER 36

EXPLOSIVES

Chapter Notes

1. This Chapter does not cover separate chemically defined compounds.

** 2. - deleted

Explanatory Notes

This Chapter includes propellent powders and explosives, viz., mixtures characterised by the fact that they contain the oxygen necessary for their combustion and that in combustion they produce at a high temperature a large volume of gas.

** /Two paragraphs of Brussels Nomenclature Note deleted, - not applicable/

* This Chapter does not cover separate chemically defined compounds (usually classified in Chapter 28 or 29), even though they may be explosive, nor does it cover cellulose nitrates (nitrocellulose) of Recommended Item 39.03.

Explanation of Changes

The changes arise from the fact that only two headings of Chapter 36 have been recommended for adoption, making Chapter Note 2 and the second and third paragraphs of the General Explanatory Note irrelevant.

The last paragraph of the Explanatory Notes has been altered to delete inapplicable portions and to emphasize the changes from certain current practices.

RECOMMENDED ITEM 37.08

CHEMICAL PRODUCTS AND FLASH LIGHT MATERIALS, OF A KIND AND IN A FORM SUITABLE FOR USE IN PHOTOGRAPHY

** Item Notes.

1. This Recommended Item is to be taken to apply only to:

   (a) Chemical products mixed or compounded for photographic uses (for example, sensitized emulsions, developers and fixers); and

   (b) Unmixed substances suitable for such uses and put up in measured portions or put up for sale by retail in a form ready for use.

2. This Recommended Item does not apply to:

   (a) Photographic pastes or gums, varnishes or similar products;

   (b) Flashbulbs and the so-called "electronic" photoflash bulbs; or

   (c) Products answering to descriptions in Recommended Items 28.49 to 28.52.

Explanatory Notes

Subject to the conditions specified at (A) and (B) below, this Recommended Item covers chemical products of a kind used directly in the production of photographic images. Such products include, inter alia:

(1) Developers to render latent photographic images visible (e.g., hydroquinone, catechol, pyrogallol).

(2) Fixers to make the developed image permanent (e.g., sodium thiosulphate (hypo), sodium metabisulphite).

(3) Intensifiers and reducers to increase or diminish the intensity of the image (e.g., potassium dichromate, mercuric chloride, ammonium persulphate).

(4) Toners to modify the colour of the image (e.g., sodium sulphide).

(5) Clearing agents to remove stains caused during development, fixation, etc. (e.g., potash alum).

(6) Emulsions.

* The most common emulsions are based on silver halides (silver bromide, silver bromide-iodide, etc.) or on salts of other precious metals, but certain other materials may be used, e.g., potassium ferricyanide and other iron compounds for blue-prints, potassium or ammonium dichromate for photomechanical engraving, etc.

The Recommended Item also covers, subject to (A) and (B) below, flash light materials, usually consisting of aluminum or magnesium, in powder, foil, etc., and sometimes mixed with other substances to promote combustion.

All the products cited above fall within the Recommended Item only when they are:

(A) Single substances which are:

(i) Put up in measured portions, that is uniformly divided up into the quantities in which they will be used, e.g., tablets, small envelopes put up containing the measured amount of powder for one developing bath.

or (ii) In packings of the kind as sold by retail and put up with any indication that they are ready for use in photography, whether by label, literature or otherwise (e.g., instructions for use, etc.).

Single substances put up other than as above, are classified according to their nature (e.g., as chemical products in Chapters 28/29, as metallic powders, etc.).

or (B) Preparations obtained by mixing or compounding together two or more substances for photographic use. Such preparations remain within the Recommended Item whether put up in bulk or small quantities and whether or not presented for sale by retail.

The Recommended Item does not cover:

(a) Auxiliary products not used directly in the production of photographic images, blue-prints, etc. (e.g., glue for mounting photographs, varnishes to protect and glaze negatives or positives, retouching paints, pencils, etc.).

(b) Flashbulbs (e.g., glass bulbs containing metallic foil which is electrically ignited and intended to be used once), and the so-called "electronic" photoflash bulbs capable of use on a number of occasions.

(c) Products answering to descriptions in Recommended Items 28.49 to 28.52 (e.g., salts and other products of precious metals), however put up and whatever their intended use.

Explanation of Changes

This Recommended Item is the only one derived from Chapter 37 of the Brussels Nomenclature. The Item Notes are based on the relevant Chapter Note and the Explanatory Notes to heading 37.08. The Explanatory Notes are taken directly from the relevant Explanatory Note, incorporating a paragraph (marked *) from the General Explanatory Note to the Chapter.

CHAPTER 38

MISCELLANEOUS CHEMICAL PRODUCTS

Chapter Notes.

1. This Chapter does not cover:

   (a) Separate chemically defined elements or compounds with the exception of the following:

   (1) - deleted;

   ** (2) Chemicals for use exclusively as disinfectants, insecticides, fungicides, herbicides, anti-sprouting products, rodenticides, or otherwise in combatting pests of a plant or animal nature, of Recommended Item 38.11;

   ** (3) Products put up as charges for fire-extinguishers (Recommended Item 38.17);

   * (4) Products specified in Note 2(a), 2(c), or 2(d) below.

   * (b) Medicaments (including veterinary medicaments).

(Additional Exclusions)

   ** (c) Soap, and flavouring, perfumery, cosmetics or toilet preparations.

   ** (d) Emulsions, dispersions and solutions of artificial resins of Chapter 39 or of Recommended Item 32.09.

2. Recommended Item 38.19 is to be taken to include the following goods which are to be taken, subject to Section Note 3, not to fall within any other item of this Section:

   (a) Cultured crystals (other than optical elements) weighing not less than 2.5 g each, of magnesium oxide or of the halides of the alkali or of the alkaline-earth metals;

   (b) Fusel oil;

   (c) Ink removers put up in packings for sale by retail;

   (d) Stencil correctors put up in packings for sale by retail;

   (e) - deleted;

   (f) Plasters specially prepared for use in dentistry; and

   (g) Mixed alkylenes with a very low degree of polymerisation.

Explanatory Notes

This Chapter covers a large number of chemical and related products.

It does not cover separate chemically defined elements or compounds (usually classified in Chapter 28 or 29), with the exception of the following:

(1) - deleted

(2) Chemicals for use exclusively as disinfectants, insecticides, fungicides, herbicides, anti-sprouting products, rodenticides, or otherwise in combatting pests of a plant or animal nature, of Recommended Item 38.11.

(3) Products put up as charges for fire-extinguishers (Recommended Item 38.17).

(4) Cultured crystals (other than optical elements) weighing not less than 2.5 g each, of magnesium oxide or of the halides of the alkali or of the alkaline-earth metals (Recommended Item 38.19).

(5) Ink removers put up in packings for sale by retail (Recommended Item 38.19).

(6) Stencil correctors put up in packings for sale by retail (Recommended Item 38.19).

(7) - deleted

** Chapter Note 2 provides that, with respect to the goods named therein, any which fall within this Section are to be classified in Recommended Item 38.19. This note does not give priority, with respect to these goods, to Recommended Item 38.19 over any item, not in this Section of Schedule "A", in which they are enumerated, nor does it override Section Note 3.

Explanation of Changes

Chapter Note 1(a)(1) and exception (1) in the Explanatory Notes have been deleted as heading 38.01 has not been recommended for adoption by the Board.

Chapter Notes 1(a)(2) and (3) and exceptions (2) and (3) in the Explanatory Notes have been altered to conform to the Recommended Schedule, and Chapter Note 1(c) has been added for the same reason.

In Chapter Note 1(a)(4) reference to 2(f) has been deleted, and exception (7) in the Explanatory Notes has been deleted because those plasters specially prepared for use in dentistry which might be described as being chemically defined are provided for elsewhere in Schedule "A".

Chapter Note 1(d) has been added, from the Explanatory Notes to heading 38.12, because of changes to the Notes for Chapter 39.

Chapter Note 2(e) has been deleted as "ceramic firing testers, fusible (for example, Seger cones)" are classifiable elsewhere in Schedule "A".

The purpose for altering the preamble of Section Note 2 is explained in the Explanatory Notes.

CHAPTER 39

ARTIFICIAL RESINS AND PLASTIC MATERIALS, CELLULOSE ESTERS AND ETHERS, AND ARTICLES THEREOF

Chapter Notes.

1. This Chapter does not cover:

(a) Stamping foils of Recommended Item 32.09;

* (b) Synthetic waxes (Recommended Item R-39);

** (c) Synthetic rubber, as defined by regulations prescribed by the Minister, or articles thereof. Until otherwise defined by the Minister, synthetic rubber is to be taken to apply and apply only to:

(A) Unsaturated synthetic substances which can be irreversibly transformed into non-thermoplastic substances by vulcanisation with sulphur, selenium or tellurium, and which, when so vulcanised as well as may be (without the addition of any substances such as plasticisers, fillers or reinforcing agents not necessary for the cross-linking), can produce non-thermoplastic substances which, at a temperature between 15° C (59°F) and 20° C (68°F), will not break on being extended to three times their original length and will return after being extended to twice their original length, within a period of two hours, to a length not greater than one and a half times their original length.

* Such substances include cis-polyisoprene, polybutadiene, polychlorobutadiene (GRM), polychlorobutadiene-acrylonitrile (GRN), polybutadiene-acrylonitrile (GRA), and butyl rubber (GRI);

(B) Thioplasts (GRP); and

(C) Natural rubber modified by grafting or mixing with artificial plastic material, provided that it complies with the requirements concerning vulcanisation, elasticity and reversibility in (A) above.

** (D) Notwithstanding paragraph (A), in the case of styrene-butadiene copolymers having the physical properties of rubber as described in paragraph (A), only those whose butadiene component is greater than the styrene component by weight are considered to be synthetic rubber. Other styrene-butadiene copolymers are to be classified in Chapter 39 as are all copolymerisation products of acrylonitrile-butadiene-styrene (ABS type).

(d) to (r) - deleted

** (Additional exclusions)

(s) Prepared additives for mineral oils (Recommended Item 38.14);

(t) Mixed polyethylene glycols or mixed alkylenes, of very low molecular weight, of Recommended Item 38.19;

(u) Textiles and textile goods provided for elsewhere in Schedule "A" including coated or impregnated fabrics, containing textile fabrics, produced by any method, including lamination;

(v) Synthetic organic tanning substances (sometimes known as "syntans") (Recommended Item 32.03);

(w) Resin mastics and cements (Recommended Item 32.12); or

(x) Prepared glazings, prepared dressings and prepared mordants of Recommended Item 38.12.

2. Recommended Items 39.01 and 39.02 are to be taken to apply only to goods of a kind produced by chemical synthesis answering to one of the following descriptions:

(a) Artificial plastics including artificial resins;

(b) Silicones;

(c) Resols, liquid polyisobutylene and similar artificial polycondensation or polymerisation products.

** (Additional Part of Note 2)

NOTE. - The above categories are to be taken to include, subject to Note 1, inter alia:

(i) polyamides;

(ii) linear saturated polyesters;

(iii) polyethers not elsewhere provided for;

(iv) polyethylene imines;

(v) polyurethanes;

(vi) epoxy resins (or ethoxyline resins) obtained from polyphenols and polyalcohols with substances containing an epoxide group; and

(vii) where appropriate, goods which chemically are products of polycondensation, polyaddition, polymerisation or copolymerisation, and find use as or in ion exchangers, protective colloids, thickeners, adhesives, extenders, etc.

3. Recommended Items 39.01 to 39.06 are to be taken to apply to materials in the following forms only:

(a) Liquid or pasty (including emulsions, dispersions and solutions);

* (b) Lumps, powders (including moulding powders), granules, flakes and similar bulk forms;

(c) Non-textile monofilament, lay-flat or other tubing, blocks, bars, rods, sticks and other profile shapes imported in lengths, all produced in uniform cross-section, whether or not surface-worked but not otherwise worked;

* (d) Plates, sheets, film, sheeting, strip and foil, whether or not printed or otherwise surface-worked but not cut to shape or otherwise worked, and rectangular articles cut therefrom, not further worked; and

(e) Waste and scrap.

(Additional Note)

** 4. In Recommended Item 39.01, the words "whether or not modified or polymerised, and whether or not linear" are to be taken only to establish the inclusion of appropriate products in the item as a whole. Classification in the sub-divisions of this item is dependent on the wording of the sub-divisions. Similar considerations apply to the modified products included in Recommended Item 39.02 and other Recommended Items of this Chapter.

Explanatory Notes

Artificial resins and plastic materials are products of various kinds and different constitution having the common characteristic of plasticity, that is of being capable, or of having been capable at some stage, of being formed under external influence (usually heat and pressure, if necessary with a solvent or plasticisers) into shapes which are retained on the removal of the external influences. The shaping processes used include moulding, casting, extruding, rolling, etc.

If a plastic material can be repeatedly softened by heat and shaped, it is termed "thermoplastic"; if in its final heat treatment it hardens with a change in composition such that it cannot again be softened by heat, it is called "thermosetting".

The artificial resins and plastic materials of this Chapter are obtained by the chemical transformation of natural organic substances or by chemical synthesis.

The Chapter also includes:

(A) Resols, liquid polyisobutylene, silicones, starch nitrates, and similar artificial high polymers which have not been polymerised further than the corresponding artificial plastic materials.

(B) Derivatives of natural resins obtained by esterification or heat treatment, and chemical derivatives of natural rubber; these are used chiefly for coating and impregnating other materials, for which purposes the artificial resins and plastics referred to above are also used.

(C) Cellulose esters and other chemical derivatives of cellulose; these are used largely in the production of certain types of plastics when mixed with suitable plasticising agents.

Plastics have almost unlimited applications but many articles made therefrom are classified elsewhere in Schedule "A".

Recommended Items 39.01 to 39.06 cover the materials of this Chapter in the following forms:

(1) Liquids or pastes: these may be the basic plastic material which requires "curing" by heat or otherwise to form the finished material, or may be emulsions, dispersions or solutions of the uncured or partly-cured materials. The liquids and pastes are used for casting, extrusion, etc., and also as impregnating materials, surface coatings, bases for varnishes and paints, and as glues, etc.

* Solutions (other than collodions) consisting of any of the products specified in Recommended Items 39.01 to 39.06 in volatile, organic solvents are excluded from the present Chapter when the weight of the solvent exceeds 50% of the weight of the solution. Such solutions are classified in Recommended Item 32.09. (Sentence deleted)

Prepared additives for mineral oils are also excluded (Recommended Item 38.14).

* (2) Powder, granules or flakes: in these forms they are employed as moulding powders and for the manufacture of varnishes, glues, etc. They may consist of the unplasticised materials which become plastic in the moulding and curing process, or of materials to which plasticisers have been added: these materials may incorporate fillers (e.g., wood flour, cellulose, textile fibres, mineral substances) or colouring matter.

* (3) Lumps and similar bulk forms, whether or not containing fillers or colouring matter.

* (4) Non-textile monofilament, lay-flat or other tubing, blocks, bars, rods, sticks and other profile shapes, all produced in uniform cross-section, whether or not containing added fillers or colouring matter, including such products which have been merely cut to a length exceeding the maximum cross-sectional dimension, or surface-worked (polished, matt-finished, etc.), but not otherwise worked. Products which have been cut down to the point where the length does not exceed the maximum cross-sectional dimension, or which have been otherwise worked (drilled, milled, etc.) are classified as articles in Recommended Item 39.07 unless excluded from the present Chapter or more specifically covered by some other item in Schedule "A".

(5) Plates, sheets, strip, film, sheeting and foil, whether or not containing fillers or colouring matter, may be printed or otherwise surface-worked (polished, embossed, coloured, etc.) or merely curved and/or corrugated, but not otherwise worked. They may also be cut into rectangles even if, as the result of being cut, they may become finished articles (e.g., tiles, wall coverings, tablecloths).

Subject to the same conditions, "cellular" or "expanded" plates, sheets, etc. expanded by chemical or physical means (expansion of gases, aeration, etc.) are also classified in Recommended Items 39.01 to 39.06.

Plates, sheets, etc., whether or not surface-worked (including rectangles cut therefrom), with ground edges, drilled, milled, hemmed, framed, or otherwise worked or cut into shapes other than rectangular shape are classified as articles in Recommended Item 39.07.

Recommended Items 39.01 to 39.06 also include the following types of plates, sheets, etc., whether they have been obtained by a single operation or by a number of successive operations, provided that the resulting products retain the essential character of products of artificial plastic material:

(a) Plates, sheets, etc., incorporating a reinforcing or a supporting mesh of another material (wire, textile yarn, glass fibres, etc.) embedded in the body of the artificial plastic material.

(b) Products made up of layers of plates, sheets, etc., of artificial plastic material, even if separated by a reinforcing mesh which is also of artificial plastic material (monofilament, rods, etc.).

(c) Products consisting of artificial plastic plates, sheets, etc., separated by a layer of another material (metal foil, textile, etc.).

(d) Products consisting of glass fibres or of layers of paper or textile fabric, impregnated with artificial resins and compressed together, provided that they have a hard, rigid character. (If having more the character of paper or textiles or of articles of glass fibres they are classified elsewhere in Schedule "A").

The provisions of the preceding sub-paragraph also apply, mutatis mutandis, to the products mentioned in paragraph (4) above.

It should be noted that gauze and netting of base metal simply dipped into an artificial plastic solution are excluded, even if the meshes are filled in by the dipping process.

In the case of plates or sheets composed of plies of wood and plastic, those in which the wood constitutes only a support or reinforcement of the plastic are classified in the present Chapter; those in which the plastic has a merely subsidiary function (e.g., when it forms the foundation for a fine veneer) are excluded.

Printed articles such as posters, calendar backs, etc., are excluded.

** Also excluded are coated or impregnated fabrics, containing textile fabrics, produced by any method, including lamination.

(6) Waste and scrap: this may consist of broken or worn articles of plastic, clearly not usable for their original purposes, or of manufacturing waste (shavings, dust, trimmings, etc.). Some waste can be re-used as moulding material, varnish base, fillers, etc.

The Chapter also excludes:

* (a) Concentrated dispersions of colouring materials in artificial plastics having the character of products of Chapter 32.

(b) Stamping foils (also known as blocking foils) composed of metal, whether or not in powder form, or pigment deposited on, or agglomerated with, artificial plastic material, and used for printing book covers, hat bands, etc. (Recommended Item 32.09).

* (c) Synthetic waxes (Recommended Item R-39).

(d) - deleted

(e) Synthetic rubber (see Chapter Note 1(c)) and articles thereof. Until otherwise defined by the Minister, synthetic rubber is to be taken to apply and to apply only to:

(A) Unsaturated synthetic substances which can be irreversibly transformed into non-thermoplastic substances by vulcanisation with sulphur, selenium or tellurium, and which, when so vulcanised as well as may be (without the addition of any substances such as plasticisers, fillers or reinforcing agents not necessary for the cross-linking), can produce non-thermoplastic substances which, at a temperature between 15°C (59°F) and 20°C (68°F), will not break on being extended to three times their original length and will return after being extended to twice their original length, within a period of two hours, to a length not greater than one and a half times their original length.

The synthetic substances having these characteristics include:

(1) Cis-polyisoprene (IR).

(2) Polybutadiene (BR).

(3) Polychlorobutadiene (GRM or CR).

(4) - deleted

(5) Polychlorobutadiene-acrylonitrile (GRN).

(6) Polybutadiene-acrylonitrile (GRA or NBR).

(7) Butyl rubber (GRI or IIR) consisting of isobutylene copolymerised with small quantities of isoprene. (It should, however, be noted that, as isobutylene polymerised alone is not vulcanisable, it is classified in item 39.02).

(B) Thioplasts (GRP) are saturated synthetic substances, obtained by the reaction of aliphatic dihalides with a sodium polysulphide; they are generally vulcanisable with the classical-type vulcanising agents. The mechanical properties of certain types of thioplasts are inferior to those of the other grades of synthetic rubber but they have the advantage of being resistant to solvents.

(C) Natural rubber modified by grafting or mixing with artificial plastic material, provided that it complies with the requirements concerning vulcanisation, elasticity and reversibility set out in paragraph (A) above.

Such rubber is usually obtained by fixing a polymerisable monomer on to the rubber by using a polymerisation catalyst or by coprecipitation of a natural rubber latex with a synthetic resin latex.

The main characteristic of modified natural rubber is that it is to a certain extent "self-reinforcing", its properties in this respect being similar to those of a mixture of natural rubber and carbon black.

(D) Notwithstanding paragraph (A), in the case of styrene-butadiene copolymers having the physical properties of rubber as described in paragraph (A), only those whose butadiene component is greater than the styrene component by weight are considered to be synthetic rubber.

In establishing the styrene-butadiene ratio, the presence of

(a) a small amount of a third monomer, such as an unsaturated acid, and,

(b) water, surface-active agents and/or stabilizers, etc., in latices, is to be disregarded.

Other styrene-butadiene copolymers are to be classified in Chapter 39 as are all copolymerisation products of acrylonitrile-butadiene-styrene (ABS type), and the following products of polycondensation: polyurethanes and silicones.

(f) Man-made fibres, including:

(i) Textile monofilament;

(ii) Strip, i.e., artificial straw and the like, (including strip folded along the length and strip in the form of flattened tube) for use as textile yarn;

(iii) Textile goods elsewhere provided for in Schedule "A".

(g) - deleted

(Additional exclusion)

** (h) Polyethers having the character of organic surfactants (Recommended Item 34.02)

** (Additional Notes)

The effect of Note 4 is to ensure that modified derivatives of the products of Recommended Items 39.01 and 39.02 remain, unless the context otherwise requires, in the same recommended item as the products from which they are derived. For example, ion exchangers based on phenol formaldehyde condensates are in Recommended Item 39.01 as are alkylated urea formaldehyde condensates, oil- or rosin-modified alkyds, styrenated alkyds, oil-modified epoxies, etc. Chlorinated polyethylene, and ion exchangers based on polystyrene, for example, are in Recommended Item 39.02.

Chemical modification produced simultaneously with or subsequently to the condensation, polycondensation, polyaddition, polymerisation or copolymerisation reaction does not of itself exclude products from Recommended Items 39.01 and 39.02.

Classification in sub-items is, however, dependent on the wording of the sub-items. Consequently, physical admixture other than specifically provided for in Recommended Items 39.01(a) or 39.02(a), would exclude the products from these sub-items. Classification of any particular product is dependent on the relationship between that product and those specifically named in the Schedule.

——— o ———

Pending the preparation of Explanatory Notes for the individual Recommended Items of this Chapter:

(A) Recommended Item 39.01 is to be interpreted in terms of the following:

Condensation and polycondensation products are formed by reaction between several molecules of the same or of different chemical constitution, with the elimination of simple substances such as water; in these products, therefore, the structural units are normally linked together by functional groups.

This category is also to be taken to include products in which the structural units are linked together by functional groups, obtained from substances which do not require the elimination of water or other simple substances. These include polyaddition products (e.g., obtained as a result of the opening of a ring or intramolecular re-arrangement).

The products described above remain classified in the present Recommended Item even if they have been subsequently polymerised.

It should be noted that with certain exceptions (see Chapter Note 2), the Recommended Item does not cover condensation products which do not have the character of artificial plastic materials (e.g., dibutyl phthalate (Recommended Item 29.15), paraldehyde (Recommended Item 29.11), mixed polyethylene glycols of very low molecular weight (Recommended Item 38.19)).

(B) Recommended Item 39.02 is to be interpreted in terms of the following:

Polymerisation products are obtained by the union of several simple molecules of the same chemical constitution (monomers) with multiple carbon-carbon bonds; as a result of the opening of these bonds, the simple molecules combine to form macromolecules. Copolymerisation products are obtained from simple molecules of different chemical constitution.

The Recommended Item covers a wide range of thermoplastic materials and soluble artificial resins, but it is pointed out that the products of Recommended Item 39.01 remain classified in that Recommended Item, even if they have subsequently been polymerised.

It should be noted that with certain exceptions (see Chapter Note 2), the present Recommended Item does not cover polymerisation products (e.g., mixed alkylenes, called tri-propylene, tetra-propylene, di-isobutylene, tri-isobutylene, etc., of Recommended Item 38.19) which are not of the nature of artificial plastic materials.

Explanation of Changes

Chapter Note 1(c) has been altered to conform with Section 2(1)(i) of the Customs Tariff (R.S.C. 1952, c. 60, as amended) and to incorporate the definition of synthetic rubber included in Note 4 to Chapter 40 of the Brussels Nomenclature, modified by paragraph (D) to adhere more closely to the existing practice regarding styrene-butadiene co-polymers. Similar changes have been made in the accompanying Explanatory Note, which is based on the Explanatory Notes to heading 40.02.

Chapter Notes 1(d) to 1(r) inclusive, and exclusion (g) in the Explanatory Notes have been deleted as being inapplicable or unnecessary in view of the "n.o.p." included in the wording of Recommended Item 39.07.

In order to maintain the existing distinctions between textiles and plastics, note 1(u) has been added, exclusion (f) in the Explanatory Notes has been altered, and other minor changes have been made. Thus, for example, the coverage of tariff items 57401-1 and 57402-1 will remain unchanged.

In order to establish more precisely the coverage of the Chapter, Note 2 has been expanded, and exclsuions 1(s), 1(t), 1(v), 1(w) and 1(x) have been added.

The structure of the Recommended Schedule has required alterations to Note 3 and the addition of Note 4, with corresponding changes in or addition to the Explanatory Notes. Reference to Notes (including explanatory notes) not available or not yet adapted for Canadian use have been deleted.

In the Brussels Nomenclature, certain packaged glues are excluded from Chapter 39. As these are covered by the appropriate Recommended Items, references to this exclusion have been deleted.

A cross-reference to the Item Notes for Recommended Item 34.02 has been added to the exclusions mentioned in the Explanatory Notes.

CANADA

Report by

THE TARIFF BOARD

Relative to the Inquiry Ordered
by the Minister of Finance
respecting

CHEMICALS

•

VOLUME 5

INORGANIC CHEMICALS IN HEADINGS
25.01, 25.03, 28.01 to 28.17, and 28.54
OF THE BRUSSELS TARIFF NOMENCLATURE

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Reference No. 120

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The Honourable Mitchell Sharp, P.C., M.P.,
Minister of Finance,
Ottawa, Ontario.

Dear Mr. Sharp:

I refer to Mr. Harris' letter of September 21, 1956 and to Mr. Fleming's letters of October 11, 1957 and December 21, 1959 in which the Tariff Board was requested to conduct an inquiry respecting chemicals.

In conformity with Section 6 of the Tariff Board Act, I have the honour to transmit Volume 5 of the Report of the Board, in English and in French. This volume contains the report on inorganic chemicals in Headings 25.01, 25.03, 28.01 to 28.17, and 28.54 of the Brussels Tariff Nomenclature. Further volumes will be forwarded to you as soon as they have been completed.

Yours sincerely,

J. C. Caudell

Chairman

Explanation of Symbols Used

- \- Denotes zero or none reported
- .. Indicates that figures are not available
- * In statistical tables, indicates a reported figure which disappears on rounding, or is negligible
- (a) A small letter in brackets denotes a footnote to a table
- (1) A number in brackets denotes a footnote to the text
- s.c. Denotes a Dominion Bureau of Statistics import or export statistical class

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The sum of the figures in a table may differ from the total, owing to rounding

A Note on the Organization of the Report - Reference 120

The first four volumes of the Report by the Tariff Board respecting Reference 120, Chemicals, relate to the reference as a whole; the eleven volumes which follow (Volumes 5 to 15, inclusive) relate to the products which were the subject of the Board's inquiry. The principal subject matter of each of the volumes is given below in terms of the headings of the Brussels Tariff Nomenclature (B.T.N.). Occasionally, chemicals of different B.T.N. headings are dealt with together, for example, chlorine (28.01) and caustic soda (28.17); the more detailed tables of contents of the individual volumes indicate where this occurs.

To the extent that particular statistical tables could be related to specific products or B.T.N. headings they are included in the statistical appendix of the volume which deals with that product or heading. Some tables, which could be related only to broader groupings of chemicals, are included in the statistical appendix to the last volume dealing with such broader groupings: inorganic chemicals in Volume 7, organic chemicals in Volume 9 and artificial resins and plastics in Volume 15.

Because of the unprecedented amplitude and complexity of Reference 120 - Chemicals, many parts of Volumes 5 to 15 were written a considerable time before the first four volumes. This gives rise, occasionally, to apparent discrepancies, attributable to the passage of time, particularly between Volume 4 and those which follow.

Table of Contents for Volumes 1 to 15, inclusive

General Volumes

Reports on Products

Table of Contents of Volume 5*

Note: Reports on products in other headings of B.T.N. Chapter 28 are contained in Volumes 6 and 7.

* The numbers shown after product designations are those used in the Brussels Tariff Nomenclature.

INORGANIC CHEMICALS (B.T.N. CHAPTER 28); SALT AND SULPHUR (B.T.N. CHAPTER 25)

INTRODUCTION

This part of the Report deals mainly with the inorganic chemicals which are classified in Chapter 28 of the Brussels Nomenclature for the Classification of Goods in Customs Tariffs. Salt and sulphur, which were considered by the Board in the course of the public hearings on Chapter 28, are also in this part of the Report. These two products, both of which are classified in Chapter 25 of the Brussels Tariff Nomenclature (B.T.N.), are referred to first in this introduction.

Salt and Sulphur

Salt, sodium chloride, is classified in heading 25.01 of the B.T.N. The heading relates to all forms of salt, including sea water and pure sodium chloride. Salt is now entered under tariff items 40, 41, 42 and 42a. Items 40 and 42a are outside the terms of Reference 120; they relate to salt for the use of the sea or gulf fisheries (item 40) and table salt containing an admixture of other ingredients (item 42a). Items 41 and 42 pertain to all other salt, in packages (item 41) or in bulk (item 42). The ad valorem equivalent of the existing specific rates under tariff item 41 is Free, B.P. and 3.5 p.c., M.F.N. and under item 42, Free, B.P. and 10 p.c., M.F.N.

Canadian consumption of salt, in 1964, was more than three million tons valued at $21.4 million. Imports were about 400,000 tons and exports 1.1 million tons.

In general, both producers and consumers of salt urged that there be no change in the existing rates; some proposed that the Brussels Tariff Nomenclature be used for Customs classification of salt.

Except for sublimed, precipitated and colloidal sulphur, which are classified in heading 28.02, all other forms of sulphur are classified in heading 25.03. Heading 25.03 relates to the forms which account for almost all of the sulphur which enters commerce including elemental sulphur recovered from natural gas or by the Frasch process from underground deposits.

In 1963, Canada produced 1.2 million tons of elemental sulphur, almost entirely from natural gas, valued at over $12 million. More than two-thirds of the total was exported. In less than a decade Canada has become one of the world's major exporters of sulphur after having been one of its largest importers. Canadian output and exports are expected to continue to grow rapidly for several years.

Most of the sulphur that is classified in heading 25.03 is entered free of duty under tariff item 208. All of the representations to the Board were for continued free entry and for the use of the B.T.N. in classifying sulphur for Customs purposes.

Introduction to Chapter 28

Chapter 28 of the Brussels Tariff Nomenclature relates, generally, to separate chemical elements and separate, chemically defined, inorganic compounds. The products classified in this chapter may contain impurities or may be dissolved in water; they are excluded from Chapter 28 when they are dissolved in solvents other than water, "unless the solution constitutes a normal and necessary method of putting up these products adopted solely for reasons of safety or for transport."(1)

Although the Chapter relates almost entirely to inorganic chemicals, it includes certain carbon compounds. The Explanatory Notes give an exhaustive list of the carbon compounds which fall within Chapter 28. Chapter 28 also relates to certain products even when they are not separate chemical elements or separate chemically defined compounds; these are also listed in Explanatory Notes. The Notes also specify other exclusions from Chapter 28. The 58 headings of Chapter 28 are divided into six major groups:

1. Chemical Elements
2. Inorganic Acids and Oxygen Compounds of Non-metals
3. Halogen and Sulphur Compounds of Non-metals
4. Inorganic Bases and Metallic Oxides, Hydroxides and Peroxides
5. Metallic Salts and Peroxysalts, of Inorganic Acids
6. Miscellaneous

The principal problems of classification of products of Chapter 28 are involved with the differentiation between products of the mining industry and those of the chemical industry. In the Brussels Tariff Nomenclature products of mineral origin are classified as mineral products if they have been subjected only to mechanical or physical processes commonly used in mineral processing and which do not alter the structure of the product; they are classified as chemicals if they have been otherwise processed, for example, by precipitation from a solution or by recrystallization. In the B.T.N. the process to which a product has been subjected is the principal means of differentiation; in the administration of the Canadian Customs Tariff, the differentiation may be based on the purity of the material. Thus, a product which has been obtained by precipitation from a solution will, under the B.T.N., always be classified as a chemical even if it contains a relatively high percentage of impurities; under the Canadian Customs Tariff the contained impurities might lead to its classification as a concentrate. As a result difficulties arise in seeking correspondence between the B.T.N. and the Customs Tariff. The problems of classification are discussed in the individual product reports.

To a large extent the chemicals classified in Chapter 28 are raw materials for further processing by the chemical industry. They include such basic products as chlorine, sulphuric acid, ammonia, caustic soda, soda ash and many others. The chapter pertains to the purest forms of the chemicals, as well as, in many instances, to less pure forms.

(1) Explanatory Notes to the Brussels Nomenclature 1955, p. 136

Many of the products classified in this chapter have been basic to chemical production in Canada from the industry's beginning. As a result, their production in Canada has long been exposed to the competitive forces which production in this country entails and to the advantages and disadvantages of such production. Even though inorganic chemicals were among the first to be manufactured in Canada, some of the most outstanding expansions in production and use of chemicals are still of these products.

Every major industry in Canada is a substantial user of inorganic chemicals, directly or indirectly, and every major chemical company in Canada includes some of them in the range of products which it manufactures or uses. For many companies, large and small, these products are a very substantial part of their output, whether for sale or for use by the company in its manufacture of other products.

Although the production of inorganic chemicals is a very appreciable factor in the Canadian economy, there is no clearly defined industry which produces them. Their production is frequently a part of a complex operation in which many other chemicals are produced. Often, they are produced as co-products or by-products of the production activity of other industries, for example, mining; sometimes they are produced only for further processing into other products, for example, fertilizers or paints.

Although a considerable amount of statistical information is available regarding the more important products of Chapter 28, very little or no information is available regarding a large number of other chemicals classified in this Chapter. In general, the latter are of little economic importance. It is probable that the value of products for which some estimate of commercial importance is possible account for more than 95 per cent of total use, production and imports.

It is estimated that sales in Canada of domestically produced chemicals of Chapter 28 had a value of the order of $165 million in 1962. The commercial value of captive use was probably almost as large, possibly about $150 million and exports were valued at approximately $15 million. Thus, Canadian production of the chemicals had a value of more than $325 million, of which 45 per cent was used captively and 55 per cent was sold, mainly in Canada. Including imports of $47 million, total sales in Canada of chemicals of Chapter 28 had an estimated value of about $212 million; imports represented nearly one-quarter of sales and nearly one-sixth of the estimated value of Canadian production. Even though the imports contain a great variety of products, a large proportion of both imports and exports is accounted for by relatively few chemicals. Many of the imports are products, or grades of products, not available from Canadian production.

Estimated Supply and Disappearance, Products of Chapter 28, 1962

	million dollars
Domestic Sales of Canadian production	165
Captive use	146
Exports	14
Total Canadian production	325
Imports	47
Total supply	372
Domestic Disappearance (supply minus exports)	358

Complete data are not available beyond 1962. Preliminary information for 1963 indicates that domestic sales from production in Canada increased by about 6 per cent, and exports in that year remained at about the level of 1962. Import statistics are not entirely comparable for the years following 1962; however, part of the apparent decline in imports in 1963 is accounted for by the drop in imports of titanium dioxide. In 1964, imports were recorded as much higher, at $58 million and higher again in 1965, at $67 million.

Each of twelve chemicals of Chapter 28 had domestic sales of $5 million or more in 1963. Combined sales of these twelve chemicals were more than two-thirds of the estimated value of sales (domestic plus imports) of all chemicals identifiable as being classified in Chapter 28. These twelve products also accounted for more than one-third of all imports and for nearly 22 per cent of exports.

Chemicals of Chapter 28, each with Estimated Sales in Canada Exceeding $5 million in 1963

B.T.N. Heading and Product	Sales in Canada	Imports	Exports
		- $'000 -	
28.01 Chlorine	14,523	2,136	1,427
28.03 Carbon black	8,411	2,141	-
28.04 Oxygen	11,834	-	-
28.08 Sulphuric acid	13,096	119	651
28.16 Ammonia	10,850	253	354
28.17 Sodium hydroxide (caustic soda)	23,753	4,573	-
28.25 Titanium dioxide	20,239	1,606	268
28.30 Calcium chloride	5,900	1,100	-
28.31 Sodium hypochloride	12,543	23	-
28.32 Sodium chlorate	6,000	-	263
28.40 Sodium tripolyphosphate	8,224	250	..
28.42 Sodium carbonate (soda ash)	12,200	1,722	-
Total of above	147,573	13,923	2,963
Total, Chapter 28 products	215,386	40,837	13,702
% of Chapter 28 total	68.5	34.1	21.6

Although the preceding table shows a number of important inorganic chemicals from the standpoint of sales, it omits some which

are produced in large quantities for captive use, for example, nitric acid, calcium carbide and phosphorus. For some that are included, such as chlorine, sulphuric acid and ammonia, the sales data tend to understate considerably their relative importance because their captive use is also very large.

When a commercial value is assigned to the estimated captive use, and this is considered together with domestic sales, ammonia sodium hydroxide, sulphuric acid and chlorine were used in Canada in 1963 in amounts of $25 million or more. The other products in the preceding list, except calcium chloride and sodium tripolyphosphate,were used in amounts exceeding $10 million, as were nitric acid and phosphoric acid.

The eleven chemicals which were consumed in amounts of $10 million or more accounted for slightly more than two-thirds of the total consumption in Canada of all products of Chapter 28. The average combined value of sales and captive use of each of the eleven exceeded $22 million; ammonia alone had a combined value of about $50 million, far in excess of either of the next two, caustic soda and sulphuric acid.

There were eleven identifiable chemicals and one group of chemicals, (the sodium phosphates), each with imports in 1963 in excess of one million dollars. These are tabulated below, with the corresponding 1964 data in brackets where available.

Chemicals with Import Values Exceeding $1 million in 1963

B.T.N. Heading and Product	Sales in Canada	Imports	Exports
		$'000	
28.01 Chlorine	14,523	2,136 (2,616)	1,427 (863)
28.03 Carbon black	8,411	2,141 (2,075)	- (-)
28.05 Sodium	1,502	1,502 (1,590)	- (-)
28.10 Phosphoric acid	2,000	1,253 (..)	- (-)
28.17 Sodium hydroxide	23,753	4,573 (5,753)	- (-)
28.25 Titanium dioxide	20,239	1,606 (843)	268 (110)
28.30 Calcium chloride	5,900	1,100 (1,171)	- (-)
28.40 Sodium phosphates	10,000	1,431 (1,250)	- (-)
28.42 Sodium carbonate (soda ash)	12,200	1,722 (3,891)	- (-)
28.43 Sodium cyanide	4,177	1,177 (1,049)	29 (..)
28.46 Sodium tetraborate (borax)	1,040	1,040 (740)	- (-)
28.47 Sodium dichromate	1,114	1,114 (1,198)	- (-)
Total of above	104,859	20,795(22,176)	1,724 (973)
% above of Chapter total	48.7	50.9	12.5

It is noteworthy that six or seven chemicals recur as of major importance in sales, consumption and imports.

Imports of the chemicals tabulated above were about 50 per cent of the estimated total value of imports in 1963 of all chemicals classified in Chapter 28. Though many of these products are made in Canada, a comparison of the magnitude of imports with domestic production is not always a meaningful measure of the competition from imports. Apart from the usual regional considerations that make it extremely

difficult for a producer in one location to compete effectively across Canada, there are often other special circumstances which give rise to imports. Caustic soda, for example, which accounted for over 11 per cent of total imports in 1963, is a co-product in production with chlorine, and the demand for chlorine limits the amount of caustic soda produced in Canada. Sodium carbonate is produced by only one company, the production capacity of which for many years has been less than Canadian market requirements; one very large user, moreover, is apprehensive about relying on only one supplier. If the special circumstances described in the individual product reports are taken into account, only a small part of the imports tabulated above would be directly competitive with Canadian production. It is estimated that imports arising out of such special situations were valued at $10.5 million in 1963, more than 25 per cent of total imports in that year.

Many imports are of products not made in Canada, or are of grades or forms of products not available from Canadian production. Available data for 1963, indicate that, for Chapter 28, these together had a value of approximately $22 million, about 56 per cent of total identifiable imports. Thus, in total, perhaps 80 per cent of the identifiable imports in 1963 were not directly competitive with Canadian production.

Exports of chemicals classified in Chapter 28 are small relative to Canadian production or use. In 1963, exports were slightly less than $14 million, of which approximately 90 per cent was accounted for by eleven products each of which had an export value of more than $400,000. Only two of these, chlorine and sulphuric acid, are among the products with greatest sales or use in Canada.

Chemicals of Chapter 28 with an Export Value Exceeding $400,000 in 1963

B.T.N. Heading and Product	Sales in Canada	Imports	Exports
		- $'000 -	
28.01 Chlorine	14,523	2,136	1,427
28.03 Acetylene black	68	-	2,201
28.04 Selenium	67	-	2,422
28.04 Tellurium	12	-	487
28.06 Hydrochloric acid	1,749	31	506
28.08 Sulphuric acid	13,096	119	651
28.19 Zinc oxide	3,048	458	980
28.23 Iron oxides	1,755	550(est.)	432
28.24 Cobalt oxide	69	35	1,508
28.38 Sodium sulphate (saltcake)	3,430	386	1,077
28.56 Calcium carbide	2,000	99	469
Total of above	39,817	3,814	12,160
% above of Chapter total	18.5	9.3	88.7

The value data used in the preceding series of comparisons reflect considerable differences in the prices of the products involved. Ten of the products had published prices ranging from about $20 per ton

to nearly $100; another ten were priced at $250 a ton or higher. Selenium, for example, was listed in the U.S.A. at $4.50 a pound (equivalent to $9,000 a ton) and acetylene black at 20 cents a pound (equivalent to $400 a ton). No published price data are available for two of the 27 products involved.

The ten products whose prices were less than $100 per ton accounted, in 1963, for about 40 per cent of the sales in Canada of all products of Chapter 28 and for nearly 30 per cent of the total imports. For these and other relatively low-priced products, freight cost is an important consideration in determining the source of supply. As the individual product analyses indicate, in many instances the difference in freight cost provides greater protection for Canadian producers supplying the major consuming areas in Canada than does the Customs Tariff. In other instances the freight disadvantage of Canadian producers is so large, at least to some parts of the market in Canada, that it would require a tariff of more than 50 p.c. to overcome it. Because the production of chemicals is concentrated chiefly in Ontario and Quebec, consumers in Western Canada and the Atlantic Provinces have the alternative of paying the freight cost from Central Canada or of importing supplies from the U.S.A. or from overseas. Frequently, the laid-down cost of the imported product (including the cost of any duty) is considerably less than that of the domestically-produced product.

As the relatively small exports indicate, the Canadian chemical industry, in the production of the inorganic chemicals of Chapter 28, is mainly engaged in satisfying the domestic demand. Some of this demand, in turn, arises from the manufacture of products that are exported in large quantities (for example, fertilizers and wood and paper products). Moreover, in a few cases, production of the chemical in Canada was based on special circumstances which permitted large-scale exports of the chemical. Acetylene black, selenium and sodium sulphate are cases in point. For many chemicals, manufacture was undertaken in Canada for such reasons as: costly transportation (for example, oxygen); the utilization of by-products of other production (sulphuric acid); to make use of available natural resources (titanium dioxide); and to supply the large demand of other Canadian industries (chlorine and caustic soda for use by the pulp and paper industry). In general, it appears clear that Canadian production of many of the important chemicals would have been undertaken even had there been no tariff protection.

However, although there is sufficient Canadian demand to warrant the production of the more important inorganic chemicals, for many others the Canadian market is, as yet, apparently too small to permit economic production. This may be true only for particular grades or forms of products, for example, for certain grades of carbon black or the anhydrous form of potassium hydroxide, or it may involve all forms or grades of a particular chemical, for example, tetrapotassium pyrophosphate or sodium.

Many of the products of this Chapter are now dutiable at rates of Free, B.P. and 15 p.c., M.F.N. if they are of a kind not made in Canada and rates of 15 p.c., B.P. and 20 p.c., M.F.N., if they are of a kind made in Canada. This applies, generally, to the less

important products classified in Chapter 28 of the B.T.N. The more important products are frequently provided for, often by name, in other items, often at lower rates than those noted above. In addition, many tariff items provide for duty-free entry for chemicals when for certain specified uses. The Board was able to identify imports of products in Chapter 28, valued at $58 million in 1964. Forty-five per cent of these were entered free of duty; the average rate of duty calculated on the total value of imports was 8.5 per cent; calculated only on the imports that were dutiable, the average rate was 15.9 per cent. Imports from countries entitled to British Preferential rates accounted for only 11 per cent of the total imports. Approximately 90 per cent of B.P. imports were duty-free; 40 per cent of the imports from M.F.N. countries were also duty-free.

Producers of chemicals expressed concern about the system of classifying products under the existing Customs Tariff which, they considered,had evolved as a result of unsystematic changes made through many years. The producers urged that those parts of the Customs Tariff which pertain to chemicals be brought into a closer relationship with developments in the chemical industry during and after World War II. They proposed a new system of classification for chemicals, patterned closely on the Brussels Nomenclature for the Classification of Goods in Customs Tariffs.

In addition to proposing a new system of classification for chemicals, most of the producers supported rates of 15 p.c., B.P. and 20 p.c., M.F.N., for chemicals made in Canada and many of them supported rates of Free, B.P. and 15 p.c., M.F.N., for those not made. Several exceptions at lower rates or free of duty were proposed. They also favoured some broadening of the concept of "made in Canada" because of the competitive nature of many products. In general, the producers did not favour the retention of end-use items which permitted duty-free entry or low rates of duty for products imported for particular uses.

The consumers of chemicals, not unnaturally, opposed increases in rates of duty on products entering into their costs of production They also opposed any broadening of the concept of "made in Canada" or changes in end-use items which would have the effect of increasing the rates of duty on chemicals used by them. The consumers frequently claimed that even when products were chemically substitutable, substitution was not always economically feasible.

The discussion of the tariff considerations is presented in detail in the product analyses which follow. With one or two exceptions, the individual product reports deal with the principal chemicals of Chapter 28 in the order of the heading in which they are classified in the Brussels Tariff Nomenclature. The exceptions relate to products so closely involved with others of a different heading that the general order of presentation would have resulted in either a loss of clarity or considerable repetition.

COMMON SALT (INCLUDING ROCK SALT, SEA SALT AND TABLE SALT); PURE SODIUM CHLORIDE; SALT LIQUORS; SEA WATER - B.T.N. 25.01

The Product and the Industry

Salt, sodium chloride, is one of the most widely used products and is distributed throughout the world in vast quantities. It occurs in solution in salt water, such as oceans, salt springs and underground brine deposits, and also in dry form (rock salt) in underground deposits. In Canada, salt is known to occur in every province, in some places in enormous quantities, but it is not produced in every province.

Salt is produced by four different methods. It is obtained by the evaporation of sea water by the sun (solar salt); by mining dry underground deposits (rock salt); by the evaporation, in vacuum pans, of natural brines or brines made by dissolving underground deposits (vacuum pan salt); and as a by-product of chemical processes.

Solar salt is coarse and relatively impure. It is used mainly for preserving fish and to a lesser extent in the control of ice on highways and for the production of chemicals. Rock salt is usually also relatively impure and coarse and is used in the same applications as solar salt. Vacuum pan salt is a very pure, fine-grained form which may be used for any purpose that solar or rock salt is used but, because of its higher cost, is used mainly in the food industries and for table use. Salt obtained as a by-product of chemical plant operations varies in purity, depending on the nature of the process from which it is derived and the extent of purification that is undertaken.

Very fine particles of salt are obtained in the processing of rock salt and vacuum pan salt. The fineness of the particles limits the salt's commercial usefulness and fine salt may be fused by heat and crushed to form a product that is like rock salt but is of higher purity. It may also be used to form blocks which are sold as livestock "licks" and to make briquettes which are processed like rock salt.

In Canada, all forms of salt are produced except solar salt. In 1964, Canada produced close to four million tons of salt with a value at plant exceeding $23 million. This included rock salt, vacuum pan salt, the salt contained in brines used captively or sold, and salt recovered from chemical operations.

Two companies produce salt for sale on a large scale, The Canadian Salt Company Limited and Sifto Salt Division of Domtar Chemicals Limited. The two companies operate eight evaporator plants, three fusion plants and three rock salt mines. The locations of the various establishments are shown on the following page.

Location of Canadian Commercial Salt Producing Plants, 1964

Location	Company	Type of Plant Evaporator	Fusion	Mine
Nappan, N.S.	Domtar(a)	x		
Pugwash, N.S.	Cdn. Salt	x		x
Sandwich, Ont.	Cdn. Salt(a)	x	x	
	Domtar	x		
Amherstburg, Ont.	Brunner Mond(a)(b)	x		
Goderich, Ont.	Domtar(a)	x		x
Ojibway, Ont.	Cdn. Salt			x
Sarnia, Ont.	Dow Chemical(a)(b)	-	-	-
Neepawa, Man.	Cdn. Salt(a)	x		
Unity, Sask.	Domtar	x	x	
Lindbergh, Alta.	Cdn. Salt	x	x	
Duvernay, Alta.	Western Chem.(a)(b)	-	-	-

(a) Natural brine deposits
(b) Mainly or entirely for captive use in production of chemicals

Source: Canadian Minerals Yearbook, 1964

Salt has been produced in Canada since 1820 at various locations and by different companies. The Canadian Salt Company Limited was formed in 1951 by the merger of the Alberta Salt Company Limited and the salt division of Canadian Industries Limited, both of which had been producing salt by the evaporation of brine. Canadian Salt entered into the production of rock salt by purchasing the Malagash Salt Company Limited in Nova Scotia in 1952, and later, in 1955, by developing a large salt mine at Ojibway, Ontario.

The Department of Mines and Technical Surveys reports:

> "The last nine years [1955 to 1963] have been ones of spectacular growth for the domestic salt industry. For several years prior to 1955, annual production hovered just under one million tons; it rose well over that amount in 1955 with the establishment of a rock salt operation at Ojibway, Ontario. The two-million-ton mark was exceeded in 1958, largely as a result of the initiation of brine exports from southern Ontario to the United States. The three-million-ton mark was exceeded in 1959, when two more rock salt mines, one at Goderich, Ontario, the other at Pugwash, Nova Scotia, were brought into production."(1)

Rock salt currently constitutes about one-half of the total Canadian production of salt, including both that for sale and that for captive use. The salt contained in brines, used or sold, accounts for more than one-third of the total. In total, these two types make up over 85 per cent of Canada's salt production. However, although shipments of fine vacuum salt are less than one-third the quantity of rock

(1) Canadian Minerals Yearbook, 1963

salt shipped, its value at plant is comparable with that of rock salt because of its much higher unit value. Salt recovered from chemical operations is of minor significance relative to other kinds.

Producers' Shipments and Captive Use of Salt, by Kind, 1962-64

	1962	1963	1964(b)	1962	1963	1964(b)
		'000 tons			$'000	
Mined Rock Salt	1,845	1,771	1,874	10,391	10,074	..
In Brines Used & Sold(a)	1,304	1,439	1,563	1,766	1,953	..
Fine Vacuum Salt	463	487	519	9,651	10,167	..
From Chemical Operations	26	25	27	119	122	..
Total	3,639	3,722	3,893	21,927	22,317	23,076

(a) Includes captive use of brine
(b) Preliminary

Source: Canadian Minerals Yearbook, 1964

It should be noted that a substantial proportion of fine vacuum salt would normally be sold in bags or other packaging. Thus, the value of producers' shipments of this type of salt would include the cost of packaging operations which add considerably to the value figure. Large quantities of fine vacuum salt are packaged in retail containers.

Ontario is by far the largest producer of salt. Nova Scotia, the only other province in which rock salt is mined, is second largest but the annual production is only about one-tenth the output in Ontario. The concentration of chemical production in Ontario together with the occurrence of salt deposits at places where chemical plants are located has made Ontario by far the largest producer and consumer of salt contained in brines.

Producers' Shipments and Captive Use of Salt by Province, 1962-64

	1962	1963	1964(a)	1962	1963	1964(a)
		'000 tons			$'000	
N.S.	313	357	431	3,113	4,044	4,740
Ont.	3,156	3,187	3,266	15,388	14,793	14,482
Man.	25	25	25	635	619	620
Sask.	55	56	70	1,337	1,364	1,569
Alta.	91	96	101	1,454	1,497	1,665
Canada	3,639	3,722	3,893	21,927	22,317	23,076

(a) Preliminary

Source: Canadian Minerals Yearbook, 1964

The average value of shipments at producers' plants varies widely for the different kinds of salt. Fine vacuum salt has the highest average value because of the greater amount of processing which it undergoes, the cost of chemicals which may be added and the costs of packaging. The average value of brines is lowest, per ton of contained salt, because the salt may be underground as a salt solution and may be used without further processing as it is pumped to the surface. Many underground brine deposits occur as saturated solutions which contain 26 per cent of salt. The wide variation in average values of the different kinds is shown below.

Average Value of Producers' Shipments of Salt, by Kind, 1962-64

	1962	1963	1964 (Prelim.)
		- $ per ton -	
Fine Vacuum Salt	20.84	20.88	..
Mined Rock Salt	5.63	5.69	..
From Chemical Operations	4.57	4.85	..
In Brines Used & Sold	1.35	1.36	..
Average	6.03	6.00	5.93

Source: Derived from data in Canadian Minerals Yearbook

The Market

Canadian consumption of salt has expanded very rapidly in recent years and has more than doubled between 1955 and 1964. In 1964, Canada produced 3.9 million tons of salt and consumed an estimated 3.2 million tons valued at $21.4 million. During 1964, there were imports of about 0.4 million tons and exports of approximately 1.1 million tons. Canadian exports in 1964 were valued at $3.6 million and imports at $1.9 million.

Apparent Domestic Disappearance of Salt, Selected Years, 1953-64

	Producers' Shipments & Captive Use (a)	Imports	Exports	Apparent Domestic Disappearance	
	- '000 tons -			'000 tons	$'000
1953	955	307	2	1,260	8,960
1955	1,245	365	146	1,464	11,005
1957	1,772	367	458	1,681	12,398
1959	3,290	370	1,274	2,386	14,973
1960	3,315	192	961 (a)	2,546	16,736
1961	3,247	199	946 (a)	2,500	17,767
1962	3,639	246	1,225 (a)	2,660	19,060
1963	3,722	333	1,150 (a)	2,906	20,297
1964 (Prelim.)	3,893	406	1,100 (a)	3,199	21,388

(a) Partly estimated

Source: Derived from Canadian Minerals Yearbook, data published by D.B.S. and U.S. import statistics

Salt is used for a wide variety of purposes but the two most important in Canada are as a raw material for the production of chemicals, particularly chlorine and caustic soda, and for snow and ice control on streets and highways. The use of salt by the chemical industry accounts for about half the total. Large quantities are also used in the meat packing industry, in pulp and paper mills, in livestock and poultry feeds, and in the processing of fish.

Consumption of Salt by Principal Use, 1957-62

	1957	1958	1959	1960	1961	1962
			- '000 tons -			
Chemicals	818	994	1,080	1,229	1,231	1,187
Snow & Ice Control	425(a)	450(a)	470	500(a)	550	650
Total Food Use	146	135	154	159	129	189
Meat Packing	50(a)	50	61	53	61	56
Fish Processing	24	21	19	30	18	75(b)
Feed Mills	23	26	28	27	..	..
Other Food Use	49	38	46	49	50	58
Pulp & Paper Mills	45	44	48	43	48	52
Other Misc. Use	9	9	9	8	8	12
Unaccounted for	238	177	625	607	534	570
Domestic Disappearance	1,681	1,809	2,386	2,546	2,500	2,660

(a) Estimated
(b) Not comparable with preceding years

Source: Canadian Minerals Yearbook; D.B.S., The Salt Industry, Cat. No. 26-214; Transcript, Vol. 33, p. 3383

About two-thirds of the 1.2 million tons of salt shown as used in chemical production is from brine produced captively. Dow Chemical at Sarnia, Ontario, Western Chemicals at Two Hills, Alberta and Brunner Mond at Amherstburg, Ontario, obtain salt for their chemical operations from underground deposits. Leaving aside the captive uses, ice control appears to provide as large a market for salt as chemical production.

Canadian consumption of salt is concentrated in Ontario and Quebec, where 80 per cent or more of the total use occurs; almost two-thirds of the Canadian total is consumed in Ontario. Most of the approximately 1.5 million tons of salt from brine are produced in Ontario. An estimated one-half million tons of salt contained in brine are exported; most of the remainder is used captively for chemical production; the balance is used to produce salt for sale. In terms of the market, Ontario appears to account for about 50 per cent of total Canadian sales. Quebec, the second largest consumer, takes 16 to 20 per cent of the total. Each of the other three regions - the Atlantic Provinces, the Prairie Provinces and British Columbia - accounts for about six per cent of the total.

Estimated Consumption of Salt by Region, 1962 and 1963

	1962	1963	1962	1963
	'000 tons		% of total	
Atlantic Provinces	151	194	6.4	6.7
Quebec	389	562	16.4	19.5
Ontario	1,522	1,807	64.3	62.7
Prairie Provinces	159	167	6.7	5.8
British Columbia	148	155	6.2	5.4
Canada	2,368[a]	2,884[a]	100.0	100.0

(a) These totals are not completely comparable with the disappearance figures in the preceding tables because of incomplete data

Source: Derived from various publications of the D.B.S.

In the Atlantic Provinces the major uses of salt are fish processing, pulp and paper production and ice control. A recently built chlorine-caustic plant in New Brunswick may also become a substantial consumer. A similar situation exists in British Columbia, except that the use of salt for chlorine-caustic soda production is much greater.

In the Prairie Provinces the principal uses are food processing, chemical production and ice control. For processing food, other than fish, vacuum pan salt is required; for chemical use, brine is chiefly used; for ice control, crushed fused salt is likely to be used because no rock salt is produced in the region.

Ontario and Quebec have a highly developed food industry, many large pulp and paper plants, an important chemical industry and a climate which necessitates the use of large quantities of salt for ice control. The market in these two provinces would therefore be substantial for all kinds of salt.

Prices and Transportation

Salt is sold in Canada through regular wholesale and retail channels, and in carlots directly to large consumers. Quantity discounts were said to be extended to large buyers and the terms of sale may be f.o.b. plant, f.o.b. destination or freight equalized. The merchant-producers of salt informed the Board that prices of rock salt had declined as new production facilities became established; prices of vacuum salt, however, had increased because of higher costs of fuel, supplies and labour.

Prices of salt are not published in Canada; in the U.S.A. published prices have been unchanged since 1958 at $1.09 per 100 pounds, for rock salt in paper bags, in carlots, and $1.34 per 100 pounds for common fine, vacuum salt, in carlots, f.o.b. New York. Per ton, these prices would be $21.80 for rock salt in bags and $26.80 for vacuum salt. The Canadian producers said that in 1961 rock salt in

bulk was priced at $8 a ton and vacuum pan salt in bulk was $11.20 a ton. These prices applied to Ontario production. In Saskatchewan, where only vacuum salt is produced, the price at plant was given as $14.80 a ton and in Nova Scotia it was $11.20 a ton, the same as in Ontario.[1]

The available statistics on shipments by producers suggest that rock salt is subject to substantial discounts. For example, in 1961 the average value at plant of shipments of rock salt was $5.96 a ton, compared with the quoted price of $8 a ton. Rock salt is produced only in Ontario and Nova Scotia. On the other hand the average value of salt produced in the Prairie Provinces varied from $16.13 a ton in Alberta to $27.35 a ton in Manitoba. (Only vacuum pan salt is produced in the Prairies.) The average value in Saskatchewan in 1961 was $25.42 a ton compared with the quoted bulk price of $14.80 a ton. For table salt, additives and packaging costs increase the price.

Average Value of Producers' Shipments of Salt, by Province, 1960-64

	1960	1961	1962	1963	1964[a]
			- $ per ton -		
Nova Scotia	13.76	11.77	9.95	11.33	11.00
Ontario	4.65	4.75	4.88	4.64	4.43
Manitoba	25.50	27.35	25.40	24.76	24.80
Saskatchewan	27.29	25.42	24.31	24.36	22.41
Alberta	16.75	16.13	15.98	15.59	16.49
Canada	5.84	6.02	6.03	6.00	5.93

(a) Preliminary

Source: Derived from data published in Canadian Minerals Yearbook

The average value of shipments in the Prairie Provinces are for vacuum pan salt only, and a fairly substantial proportion would be salt for table use and food processing. For Nova Scotia, the figures represent both vacuum pan and rock salt. The comparatively low average values of Ontario shipments are explained by the large volume of brine used in the province and exported.

Because salt is a commodity having a low unit value, the cost of freight is an important consideration in its laid-down cost. In 1962 and 1963, mined rock salt constituted about 50 per cent of total use and brines about 38 per cent of the total. However, brines would normally not be transported any considerable distance, so that rock salt would represent the bulk of the commercial trade. Excluding salt contained in brines, shipments of rock salt represented nearly 80 per cent of total shipments in 1962 and 1963. The average value of rock salt shipments in 1962 was $5.63 a ton and in 1963 approximately the same.

(1) Transcript, Vol. 23, p. 3419-20

The table which follows shows the cost of rail freight from Ontario producers' plants to selected destinations. These rates are agreed charges and are the lowest rail rates between points of production and selected major consuming points in Ontario and Quebec. The agreed charge from Ontario to Winnipeg is also given.

Agreed Charges for Salt in Bulk, Lowest Rates in Effect at the Beginning of 1965

	Point of Origin			
Destination	Ojibway	Goderich	Sarnia & Sandwich	Quarries & Amherstburg
		- $ per ton -		
Quebec				
Beauharnois	4.38	4.38	4.38	4.38
Shawinigan	4.65	4.65	4.65	5.35
Montreal	4.80	..	..	4.80
Quebec City	5.60	5.60	..	..
Temiskaming	9.80	9.80	9.80	9.80
Ontario				
Clarkson	3.15	..	..	..
Toronto	3.45	..	..	..
Cornwall	4.00	4.00	..	4.00
Maitland	5.40	5.40	..	..
Barrie	..	7.60	..	..
Winnipeg, Man.	12.90	12.90	..	..

Source: Agreed charges as published by the Canadian Freight Association

Relative to an average value at plant of about $5.60 a ton, the freight rates given in the preceding table would be a substantial part of the laid-down cost of salt. At Cornwall, where there is a large consumption of salt for chlorine-caustic soda production, the freight cost of $4 a ton would be more than 40 per cent of the laid-down cost. On deliveries to Winnipeg, the freight cost of $12.90 a ton would be more than twice the average value of the salt, f.o.b. producer's plant.

The agreed charges from plants in the Prairie Provinces to Winnipeg and some British Columbia destinations are shown below. The rates given indicate why British Columbia may be expected to rely on imports for supplies of rock salt. The lowest rate from Prairie plants to B.C. points is $18 a ton. Thus, a consumer in British Columbia who required rock salt would be faced with a choice between obtaining imported rock salt by boat and purchasing crushed fused salt from Prairie producers and paying the very substantial cost of $18 a ton for transportation. At the public hearing, it was said that Mexican salt can be laid down at Vancouver at a cost of $10 a ton, suggesting a freight cost from Mexico of about $8 a ton.

Agreed Charges for Salt in Bulk, Lowest Rates in Effect at the Beginning of 1965

Destination	Point of Origin: Neepawa, Man.	Unity, Sask.	Lindbergh, Alta.
		- $ per ton -	
Winnipeg, Man.	..	10.00	..
Kitimat, B.C.	18.30	18.30	18.30
Prince Rupert, B.C.	18.30	18.30	18.30
Vancouver, B.C.	18.00	18.00	18.00

Source: Agreed Charges as published by the Canadian Freight Association

Surplus and Deficit Regions

Although salt is known to occur in all parts of Canada, it is produced at relatively few locations. For some areas, therefore, there may be no domestic source of particular kinds of salt within reasonable distance. For example, the nearest domestic source of rock salt for British Columbia consumers is in Ontario and the alternative domestic product is crushed fused salt from Alberta. Solar salt from the U.S.A. or Mexico can be landed in B.C. at very much lower cost and is suitable for much of the province's needs.

The tabulation below indicates the surplus or deficit position of the individual regions with respect to salt. For the purposes of the table, it has been assumed that the salt contained in the brine exported by pipeline from Ontario in 1963 was 500,000 tons, the approximate amount exported in this way in 1958 and 1959 according to published data.

Estimated Consumption of Salt Compared with Production of Salt, by Region, 1963

Region	Estimated Consumption	Production	Deficit	Surplus
		- thousand tons -		
Atlantic Provinces	194	357	-	163
Quebec	562	-	562	-
Ontario	1,807	3,187	-	1,380
Prairie Provinces	167	178	-	11
British Columbia	155	-	155	-
Canada	2,884	3,722	-	838

Source: Derived from various publications of the D.B.S.

In the Atlantic Provinces production occurs only in Nova Scotia; the other Atlantic Provinces are supplied from Nova Scotia, Ontario and from abroad; the surplus production goes to Quebec or is exported.

Quebec's supplies of salt are obtained from Ontario, Nova Scotia and from other countries. From shipping statistics, it appears that in 1963 about two-thirds of Quebec's requirements were met by salt from Ontario; nearly a quarter of the total came from Nova Scotia and imports supplied about ten per cent of the province's use.

In 1963, about one-third of Ontario's estimated surplus of 1.4 million tons of salt was moved to Quebec and most of the remainder was exported, almost entirely to the U.S.A. Small amounts were also shipped to Manitoba whose production was insufficient to supply provincial needs. A small quantity might also have been shipped directly to British Columbia.

The Prairie Provinces, as a group, have a small surplus of production estimated at 11,000 tons in 1963. This surplus was shipped to British Columbia. Of the Prairie Provinces, Manitoba alone has a deficit which can be made up by supplies from Ontario, the other Prairie Provinces and relatively small imports from the U.S.A.

Like Quebec, British Columbia is a major deficit area; it has no production and uses about 150,000 tons annually. In 1963, shipments by rail from other provinces into B.C. amounted to 22,000 tons suggesting that the surplus available from prairie output, supplemented by shipments from Ontario, supplied about 15 per cent of the province's requirements. Thus, approximately 85 per cent of British Columbia's supplies were imported, mainly from Mexico and the U.S.A.

Foreign Trade

Until 1955 Canada was a substantial net importer of salt. For example, in 1954 exports were negligible and 370,000 tons were imported. In 1955 Canadian Salt began to exploit the Ojibway rock salt deposits and by 1956 exports were about equal to imports. In 1958 the company also began to export brine from its Sandwich, Ontario deposits to the U.S.A. through a pipeline. In 1958 Canadian exports exceeded imports by almost 600,000 tons. In 1959 the rock salt mines at Goderich, Ontario and Pugwash, Nova Scotia were brought into production. Although the level of exports was unaffected by these new sources of supply, the new mines supplied the growing domestic demand. Even so, imports have been increasing gradually from the low of 192,000 tons in 1960. In 1964, 406,000 tons were imported.

Imports supplied between 20 and 25 per cent of consumption in the mid-1950's but only 7.5 per cent in 1960. Since then, imports increased to 11.5 per cent of consumption in 1963. However, during the period 1960-64, exports greatly exceeded imports in terms both of estimated quantity and value. Since 1958, Canada's exports have exceeded imports by about two or three million dollars annually.

Exports and Imports of Salt, Selected Years, 1953-64

	Exports[a]	Imports	Exports	Imports	Net Exports (Exports - Imports)	
	'000 tons		$'000		'000 tons	$'000
1953	2	307	32	2,017	-305[b]	-1,985[b]
1955	146	365	1,001	1,884	-219[b]	- 883[b]
1957	458	367	3,241	1,649	91	1,592
1959	1,274	370	4,640	1,578	904	3,062
1960	961	192	3,461	841	769	2,620
1961	946	199	2,829	1,044	747	1,785
1962	1,225	246	3,988	1,121	979	2,867
1963	1,150	333	3,701	1,681	817	2,020
1964	1,100	406	3,619	1,931	694	1,688

(a) Estimated for years 1960-64
(b) Net deficit

Source: D.B.S., Trade of Canada, and Tariff Board estimates

Imports

Canada's imports of salt consist of three kinds, solar salt, rock salt and table salt. Of these, imports of rock salt and solar salt in bulk are the most important both in terms of quantity and value. The published statistics do not permit the separation of imports of solar salt from rock salt; for most purposes, they are interchangeable. A substantial proportion of the imports of solar salt were said to be used in processing fish, and imports of salt for this purpose are published separately. Although these data include both solar and rock salt, the Canadian producers believed that most imports of fishery salt are of solar salt.

Imports of Salt, by Kind, Selected Years, 1953-64

	Quantity			Value		
	Fishery Salt	Salt in Bulk	Salt in Coverings	Fishery Salt	Salt in Bulk	Salt in Coverings
	- '000 tons -			- $'000 -		
1953	60	211	36	369	1,115	531
1955	50	280	36	300	1,127	437
1957	75	274	18	292	1,039	282
1959	64	291	15	258	1,018	239
1960	65	116	10	261	321	203
1961	61	126	11	256	437	229
1962	48	186	11	181	608	234
1963	67	255	11	304	1,011	266
1964	46	360[a]	..	225	1,706[a]	..

(a) Includes salt in coverings

Source: D.B.S., Trade of Canada, Imports, s.c. 7297, s.c. 7298, s.c. 7299

In 1962 and 1963, 75 per cent of the salt imported into Canada was in bulk for purposes other than use in fisheries; 20 per cent was for use in fisheries and 5 per cent was in bags and other coverings. Salt in bulk and fishery salt were comparable in average value per ton, but salt in coverings had a very much higher value. In 1963, for example, salt in bags or other coverings had an average value of almost $24 a ton compared with $4.56 per ton for fishery salt and $3.98 a ton for salt in bulk. As a result, although imports of salt in bags or other coverings were only five per cent of the total tonnage in 1962 and 1963, in value it was comparable with fishery salt.

Of the total imports of 333,000 tons in 1963, approximately 50 per cent came from the U.S.A., 30 per cent from Mexico, and almost all of the remainder from Spain and the West Indies. In value terms, the imports were concentrated more heavily in the U.S.A., with over 60 per cent of the $1.6 million worth of imports coming from that country in 1963.

Imports of Salt, by Principal Kind and Country of Origin, 1963

	Quantity			Value		
	Fishery Salt	Salt in Coverings	Salt in Bulk	Fishery Salt	Salt in Coverings	Salt in Bulk
		- '000 tons -			- $'000 -	
U.S.A.	2	11	155	8	259	892
Mexico	-	-	99	-	-	120
Spain	40	-	-	144	-	-
W. Indies	25	-	-	150	-	-
Other	*	*	-	2	7	-
Total	67	11	255	304	266	1,011

Source: D.B.S., Trade of Canada, Imports

Fishery salt, perhaps all solar salt, imported almost entirely from Spain and the West Indies is entered in Newfoundland and Nova Scotia.

Salt in bags, barrels or other coverings was entered in almost all provinces in remarkably stable amounts from 1960 to 1963; about two-thirds of it was entered in Ontario and Quebec. In recent years almost all imports of this salt have been from the U.S.A., the U.K. being the only other supplier.

The average value of salt in coverings is usually about five or six times that of bulk salt; the average value increased from $16.36 per ton in 1959 to about $23.88 per ton in 1963.

Imports of Salt in Bags, Barrels or Other Coverings, by Region of Entry, 1962 and 1963

	1962	1963	1962	1963
	tons		$'000	
Atlantic Provinces	901	891	20	21
Quebec & Ontario	7,191	6,897	160	180
Prairie Provinces	1,925	2,168	40	45
British Columbia	999	1,192	13	20
Canada	11,015	11,148	234	266

Source: D.B.S., s.c. 7299

Salt in bulk was imported almost entirely from the U.S.A. until 1957 when imports from Mexico began to supply British Columbia. Imports in bulk from Mexico and from the U.S.A. are now roughly equal in quantity; Mexico supplies 75 to 90 per cent of the B.C. market and the U.S.A. supplies mainly the market in Ontario and Quebec but also small amounts to other provinces.

Imports of Salt in Bulk, by Region of Entry, 1962 and 1963

	1962	1963	1962	1963
	'000 tons		$'000	
Atlantic Provinces	-	-	-	-
Quebec	8	54	54	324
Ontario	51	68	280	395
Prairie Provinces	1	*	21	4
British Columbia	126	132	253	288
Canada	186	255	608	1,011

Source: D.B.S., s.c. 7298

Import data for table salt are available only until 1962, in which year about 1,200 tons valued at $98,000 were entered, almost all from the U.S.A. Relative to imports of other kinds of salt and the total market for salt, table salt imports are of negligible importance.

Between 55 per cent and 65 per cent of the imports of salt are entered in two provinces, British Columbia and Newfoundland, both of which are far from domestic producers and both of which can take advantage of relatively cheap ocean transport to obtain supplies. Almost all imports into Newfoundland and the other Atlantic Provinces were of fishery salt, which is outside the terms of this Reference. Most of the remaining imports are into Ontario and Quebec.

Estimated Consumption and Imports of Salt, by Region, 1963

	Imports				Estimated Consumption	% Imports of Cons.
	Fishery Salt	Bags, etc.	Bulk	Total		
	'000 tons					per cent
Newfoundland	50.5	0.2	-	50.7	53.7	94
Other Atl. Provs.	15.8	0.7	-	16.5	140.7	12
Quebec & Ontario	0.5	6.9	122.3	129.7	2,368.8	5
Prairie Provs.	-	2.2	0.2	2.4	166.6	1
Br. Columbia	-	1.2	132.0	133.2	154.7	86
Canada	66.8	11.1	254.6	332.6	2,884.4	11

Source: Derived from various publications of the D.B.S.

The available information indicates that 95 per cent of the imports entered in British Columbia in 1963 were delivered by ocean vessels. Of the imports that were entered in Ontario and Quebec in 1963, about 85 per cent were also delivered by boat to Great Lakes and St. Lawrence Seaway ports. In 1963, 80 per cent of all imports from the U.S.A. were transported by water. Ontario is the only province into which imports by rail are significant. Even so, 70 per cent of Ontario's imports were water-borne.

Exports

Canadian exports of salt exceed imports by a considerable margin, in terms of both quantity and value. Almost all exports are to the U.S.A.; less than one per cent of the total is exported to a large number of other countries, mainly in the Caribbean area, Australia and New Zealand. The importance of the U.S.A. as a market for Canadian salt is shown in the tabulation which follows:

Exports of Salt to the U.S.A. and Other Countries, 1959-64

	U.S.A.(a)	Others(b)	Total	U.S.A.	Others	Total
	- '000 tons -			- $'000 -		
1959	1,274	*	1,274	4,630	10	4,640
1960	960	1	961	3,398	63	3,461
1961	945	1	946	2,695	134	2,829
1962	1,224	1	1,225	3,920	68	3,988
1963	1,147	3	1,149	3,511	190	3,701
1964	..	..	..	3,405	214	3,619

(a) Assumes 500,000 tons of salt in brine exported in each year 1960-63; see Canadian Minerals Yearbook, 1961
(b) Derived from shipping statistics, D.B.S.

Source: D.B.S., Trade of Canada, Exports, s.c. 7640, s.c. 279-70 and s.c. 279-72; Shipping Report Cat. Nos. 54-202, 54-203, 54-206; Railway Freight Traffic, Cat. 52-205

Exports are mainly from Ontario, but increasing amounts are being exported from Nova Scotia. The Prairie Provinces apparently export only a very small part of the surplus which occurs in that region; most of the surplus is shipped to British Columbia. It is estimated that, in 1962, 725,000 tons of dry salt were exported from Canada, of which 664,000 tons were from Ontario's production and 60,000 tons from Nova Scotia's production. In 1963 the comparable figures were 649,000 tons of dry salt exported, 566,000 tons being from Ontario and 83,000 tons from Nova Scotia. These figures exclude the salt content of the brine exported from Ontario which, as noted above, is estimated at 500,000 tons a year.

Tariff Considerations

Salt is entered mainly under tariff items 40, 41, 42 and 42a. Items 40 and 42a are outside the terms of the current Reference; they are given below for information together with the other tariff items which relate to salt.

	British Preferential Tariff	Most-Favoured-Nation Tariff
Item 40		
Salt for the use of the sea or gulf fisheries............................	Free	Free
Item 41		
Salt, n.o.p., in bags, barrels and other coverings........................... per one hundred pounds	Free	$3\frac{1}{2}$ cts.
Item 42		
Salt, in bulk, n.o.p.................... per one hundred pounds	Free	3 cts.
Item 42a		
Table salt made by an admixture of other ingredients, when containing not less than ninety per cent of pure salt.....	5 p.c.	10 p.c.

Iodized mineral salts used in the feeding of animals may be entered at Free, B.P., 10 p.c., M.F.N. under tariff item 663f, which is not within the terms of Reference.

At the public hearing in January 1961, the Canadian Salt Company Limited and the Sifto Salt (1960) Limited, in a joint submission to the Board, proposed that the existing rates of duty under items 41 and 42 be continued.(1)

(1) Transcript, Vol. 23, p. 3391

The Electric Reduction Company of Canada Limited expressed an interest in bulk salt of item 42 and proposed the continuation of the existing rates in a tariff item worded like heading 25.01 of the Brussels Tariff Nomenclature.(1)

Consolidated Mining and Smelting Company of Canada Limited proposed that there be no increase in the rates of duty for chemicals used in Canadian production. The company expressed an interest in salt.(2)

The Canadian Pulp and Paper Association strongly opposed any increase in rates for chemicals used in the production of pulp and paper and listed salt as an important chemical used by members of the industry.(3)

The Canadian Pharmaceutical Manufacturers Association proposed rates of 15 p.c., B.P. and 20 p.c., M.F.N. for chemicals made in Canada and used in the manufacture of pharmaceuticals. The Association listed sodium chloride as one of the more important chemicals used by its members.(4)

Polymer Corporation Limited expressed an interest in salt as a raw material used by the company. Polymer proposed the continuation of end-use item 851 which provides for free entry for chemicals used in the manufacture of synthetic rubber.(5)

The Canadian Federation of Agriculture expressed an interest in sodium chloride as a chemical used in the production of livestock feeds and pesticides. The Federation proposed free entry under both the B.P. and M.F.N. Tariffs for chemicals so used.(6) If used in the manufacture of animal or poultry feeds, sodium chloride at present may be entered free of duty under tariff item 219h, an item not in Reference 120. As a material for use in the manufacture of pesticides, it may be entered duty-free under tariff item 791.

No other representations were made to the Board related specifically to salt of B.T.N. heading 25.01.

The proposals of Polymer, the Pharmaceutical Manufacturers Association and the Federation of Agriculture were related to proposed end-use items. The other representations would involve no change in the existing rates for salt under tariff items 41 and 42.

Imports of salt in bags, barrels or other coverings are entered under item 41; imports have come only from the U.K. and the U.S.A. in recent years. Imports from the U.K. are negligible so that the M.F.N. rate is the effective rate of duty for 97 per cent of imports of salt in containers. The average value of imports of salt in containers is relatively high, about $20 or more a ton. As a result, the ad valorem equivalent of the specific duty of 3.5 cents a hundredweight on imports from the U.S.A. has been about 3.5 per cent.

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(1) Transcript, Vol. 4, p. 678
(2) Same, Vol. 5, p. 715
(3) Same, Vol. 85, p. 13006
(4) Same, Vol. 87, p. 13321
(5) Same, Vol. 89, p. 13501
(6) Same, Vol. 78, p. 11925; Vol. 110, p. 16631

Under item 42 (salt in bulk), imports from British preferential countries are entered free of duty. However, no imports of salt in bulk have been recorded in recent years so that the effective duty is the specific M.F.N. rate of three cents per 100 pounds, or 60 cents per ton. Salt in bulk has been imported only from the U.S.A. and Mexico in recent years; all Mexican salt entered in British Columbia and most of the United States salt entered in Ontario and Quebec. During the four years 1960 to 1963, the ad valorem equivalent of the specific duty on imports from the U.S.A. has been approximately 10 per cent. The average value of these imports has varied within very narrow limits, from $5.62 a ton in 1960 to $5.74 a ton in 1963. During the same period, the average value of imports from Mexico varied between $1.20 a ton and $1.24 a ton, and the ad valorem equivalent for these imports was approximately 50 per cent.

In support of their proposals, the Canadian merchant-producers of salt referred to the potential competition in southern Ontario from U.S. producers located in Michigan, Ohio and New York. They also referred to the mining royalties which they now pay to provincial governments and in some cases also to the federal government and claimed that these increased their costs. Their spokesman said:

> "we have pursued a vigorous development policy and have been able to operate at these /the existing/ tariff levels. We would, however, find difficulty if these moderate rates were not available."(1)

Later in the hearing a spokesman for Sifto Salt said:

> "our company...is now developing an export business in particularly rock salt into the United States, and we would be loathe to do anything to the duties in Canada which might affect the American tariff structure in such a way that it would hinder our development of exports into the U.S.A."(2)

The others who made representations to the Board regarding salt generally supported their proposals that rates not be increased on the grounds that an increase would affect their costs of production and therefore their ability to compete in the domestic and export markets. The Pulp and Paper Association and Consolidated Mining and Smelting presented such an argument.

Canada's imports of salt under tariff items 41 and 42 were 197,000 tons in 1962 and 266,000 tons in 1963. In 1962, 64 per cent of the total and, in 1963, 50 per cent of the total, were entered in British Columbia. The Canadian producers said that imported salt can be laid down at Vancouver at a cost of $10 a ton; rail freight alone from the most advantageously located Canadian plant would be $18 a ton. The freight disadvantage of Canadian producers in the British Columbia market is so large that the Customs Tariff is unlikely to assist Canadian producers in the B.C. market.

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(1) Transcript, Vol. 23, p. 3390
(2) Same, Vol. 23, p. 3443

Imports into the rest of Canada, exclusive of salt for fisheries, amounted to 70,000 tons in 1962 and 132,000 tons in 1963. These imports represented three per cent of the consumption in these provinces in 1962 and five per cent of consumption in 1963. During these two years, Canadian exports of comparable salt (mainly dry rock salt) were estimated to be 725,000 tons in 1962 and 650,000 tons in 1963, several times as much as imports. Almost all of the imports were from the U.S.A. and almost all exports were to the U.S.A.

Canadian exports to the U.S.A. greatly exceed Canadian imports from the U.S.A., and the data indicate that most of this trade occurs in the Great Lakes and St. Lawrence border region. This suggests that the trade is complementary, United States plants supplying some Canadian consumers, probably because of an advantage in freight costs, and that Canadian producers are more advantageously located to serve a larger market in the U.S.A.

A Note on Classification

If, as proposed by the Industry Committee and others, the wording of B.T.N. heading 25.01 were used for a new tariff item, it would apply to all salt, including the table salt of tariff item 42a. This item is outside the terms of Reference 120. The Industry Committee recommended that item 42a be relocated under heading 25.01 with no change in rates.(1) Similarly, end-use item 40, salt for the use of sea or gulf fisheries, could be relocated; any salt entered under tariff item 663f, iodized mineral salt for feeding animals, likely would not be affected by the implementation of the proposed item.

Some of the provisions of B.T.N. heading 25.01, such as those for sea water and pure sodium chloride, are understood to be of no importance in Canada's international trade at present.

Drawback Item 1065

Drawback item 1065 provides for a drawback of 99 per cent of the duty paid on bituminous coal when used in melting, evaporating and preparing salt produced in Canada, when such salt or brine is not further manufactured than as provided for in tariff items 40, 41, 42, 42a. This drawback item was also called for the hearing of January 23, 1961, along with tariff items 41 and 42 dealing with salt.

The Canadian Salt Company Limited urged that fuel oil also be included under the existing drawback item with the same provisions as those for bituminous coal.(2)

At the public hearing in January 1961, the Chairman of the Tariff Board referred to the letter of reference from the Minister of Finance which stated, in part, "I have decided not to include in the

(1) Transcript, Vol. 23, p. 3368
(2) Same, Vol. 23, p. 3449

reference items relating to petroleum products."[1] The Chairman also referred to the tardiness of the brief presented by Canadian Salt and said:

> "If after hearing your representations, the Board should come to the conclusion that it should give them [other interests, such as the fuel oil industry] further consideration, it may well be that it would have to call a further hearing..."[2]

The Board considered the matter and decided not to accept the proposal by The Canadian Salt Company; consequently, no later hearings were scheduled for submissions regarding drawback item 1065.

(1) Transcript, Vol. 23, p. 3444
(2) Same, Vol. 23, p. 3445

SULPHUR OF ALL KINDS, OTHER THAN SUBLIMED SULPHUR, PRECIPITATED SULPHUR AND COLLOIDAL SULPHUR - B.T.N. 25.03

The Product

Sulphur or brimstone (burning stone) is a yellow, crystalline element displaying non-metallic properties. It is insoluble in water and therefore can be stored without shelter. It occurs in nature mainly in sedimentary and volcanic deposits as crude elemental sulphur. It also occurs in combination with other elements, as a sulphide or sulphate, for example, in natural gas and mineral ores.

Sulphur is obtained by mechanical separation from natural deposits; by injecting superheated steam through pipes sunk into bore holes and thus melting and forcing the molten sulphur to the surface (Frasch process); by roasting pyrites or other sulphide ores and recovering it from the gases; and by removing it from natural gas. Small quantities are also recovered from industrial wastes such as oil refinery gases. Sulphur produced by the Frasch process or recovered from natural gas and oil refinery wastes contains such small amounts of impurities that it is practically never refined.

Sulphur may be purified and concentrated by mechanical processes such as washing, grinding and sieving. It may also be refined in other ways, including slow distillation and condensation (sublimed sulphur), precipitation from a solution (precipitated sulphur), or the action of hydrogen sulphide on a solution of sulphur dioxide containing gelatin (colloidal sulphur).

Because hearings were scheduled according to the Brussels Tariff Nomenclature, sulphur came before the Board under two headings. One of these, B.T.N. 28.02, provides for "sulphur, sublimed or precipitated; colloidal sulphur"; the other, B.T.N. 25.03, provides for "sulphur of all kinds, other than sublimed sulphur, precipitated sulphur and colloidal sulphur." Sulphur of either heading, if packaged for sale, for example, as a disinfectant or fungicide, is classified under heading 38.11 of the B.T.N.

The principal form of sulphur classified under heading 25.03 is that commonly designated as "elemental sulphur". This is the sulphur obtained by the Frasch process or removed from natural gas or other materials containing it. It is this sulphur which is the subject of this section of the report. Sublimed, precipitated and colloidal sulphur, the only forms not classified under heading 25.03, are dealt with under heading 28.02.

Most of the elemental sulphur now produced in Canada is extracted from natural gas. Much of the natural gas, as it flows from a well, is said to be "sour" because it contains hydrogen sulphide and other sulphur compounds which must be removed before the gas can be transmitted by pipeline or used in appliances. The amount of hydrogen sulphide in the gas found in Western Canada varies from less than one per cent to more than 85 per cent of the weight of the gas. Because hydrogen sulphide poses a serious problem of disposal, production of

elemental sulphur is virtually inevitable, the amount produced being determined by the quantity of gas transmitted and its hydrogen sulphide content.

Another important source of sulphur is waste smelter gas. Large tonnages of metal sulphide ores are smelted in Canada and the waste gas contains sulphur dioxide. Because some of this gas contains about 75 per cent of sulphur dioxide, it is a rich source of sulphur. In many instances, waste smelter gas is processed because sulphur dioxide is odorous and highly toxic to plant and animal life and cannot be vented into the atmosphere. Typically, the sulphur dioxide contained in waste smelter gases is cleaned and used to produce sulphuric acid and liquid sulphur dioxide without actually recovering elemental sulphur.

Because sulphur is prized mainly for its use as a material for further processing, it competes with sulphur-bearing materials such as pyrites and pyrrhotite. When heated to high temperatures, they release sulphur dioxide which can be recovered or can be converted directly into sulphuric acid. These concentrates were the first raw materials used in Canada for the manufacture of sulphuric acid and sulphur dioxide. Although ordinarily the concentrates cannot compete with elemental sulphur, they are used at some locations because of the high cost of transporting sulphur or because of the iron or other metals which can be extracted from them. Recent prices of sulphur have made pyrites more attractive as a source of the product.

Some elemental sulphur is recovered from the refining of nickel sulphide matte at Port Colborne, Ontario and Thompson, Manitoba; some was recovered from pyrite at Port Robinson, Ontario between 1954 and 1959; some from pyrrhotite at Kimberley, British Columbia between 1936 and 1943; and some, contained in nickel sulphide ore, is converted into ammonium sulphate at Fort Saskatchewan, Alberta. These operations were not large sources of sulphur relative to the quantities extracted from natural gas or represented by waste smelter gases or pyrites.

In 1958, relatively small quantities of sulphur began to be recovered from oil refinery wastes at Montreal, Quebec and Saint John, New Brunswick. Since 1958, such operations have also been established at Trafalgar, Sarnia and Clarkson, Ontario. It is estimated that in 1964 about 75,000 tons of elemental sulphur could be extracted annually from oil refinery wastes by the plants equipped to do so.

The Industry

The commercial production of elemental sulphur in Canada began in 1936 when a plant at Trail, British Columbia, using zinc roaster gases, came into operation. From 1936 to 1943, Canadian output averaged about 40,000 tons annually. In 1943, the sulphur dioxide feed material was diverted to fertilizer production in order to meet wartime needs.[1]

(1) Industrial and Engineering Chemistry, Vol. 42, No. 11, p. 2243

In 1951, the first Canadian plant to extract sulphur from natural gas was established. This plant was built by the Shell Oil Company Limited at Jumping Pound, Alberta and came into operation in February 1952 with a capacity of about 12,000 tons per year. The expansion of western Canadian production since then has been extremely rapid; in 1963, shipments were 1.2 million tons with a value of $12.2 million.

The figures cited above include the small amounts of elemental sulphur extracted from nickel sulphide matte, but exclude the sulphur extracted from imported crude oil by the oil refineries at Montreal and Saint John. In 1963, if the two refineries had operated at capacity, they could have produced an additional 35,000 tons. In 1964, the five refineries which were then recovering elemental sulphur from their wastes could have produced about 75,000 tons. It is apparent that relative to the amounts of sulphur extracted from natural gas the output by the oil refineries is very small.

In 1963, 94 per cent of Canadian capacity to extract sulphur from natural gas was in Alberta and all the additional recovery plants under construction at that time were also in that province. In addition, several plants were projected which are expected to be in operation before 1970 when Canadian capacity would be at least three million tons of elemental sulphur per year, about six times the total amount consumed in Canada in 1961.

Productive Capacity(a) of Plants Recovering Sulphur from Natural Gas, by Province, 1963

	In Production	Under Construction
	thousand tons	
Saskatchewan	2	-
Alberta	2,017	207
British Columbia	115	-
Total	2,134	207

(a) Assumes 350 days operation per year

Source: Canadian Minerals Yearbook

As indicated earlier, at least until recently the rapidly increasing production in Canada has not been in response to domestic or foreign demand for sulphur, but as an inevitable consequence of a very rapid growth in sales of natural gas. As a result, very large quantities of sulphur for which no market existed were produced in the Prairie Provinces and large stockpiles accumulated. By the end of 1962, almost one million tons of sulphur had been stockpiled in Alberta. However, in 1963, serious world shortages of sulphur developed and in spite of a nearly doubled output during the year the stockpile increased by only 150,000 tons. In 1964, there was a further increase in production, but the even greater increase in sales resulted in a reduction of the stockpile by more than 100,000 tons.

It is apparent from the table which follows that the domestic market for elemental sulphur has become much less important than foreign markets as an outlet for Canadian sulphur. It is probable that this situation will become even more pronounced as new extraction plants come into production. Moreover, because world demand is expected to continue to expand at a rapid rate, it is probable that some of the plants will begin to use gas deposits containing higher percentages of hydrogen sulphide; in the past such deposits were considered to be less desirable because their use led to accumulations of by-product sulphur.

Shipments, Imports, Exports and Domestic Disappearance of Elemental Sulphur, Selected Years, 1957-64

	Shipments[a]	Imports	Exports	Domestic Disappearance[a]
		- thousand tons -		
1957	93	417	12	498
1959	146	332	27	452
1961	395	330	218	506
1962	695	195	400	490
1963	1,162	151	821	491
1964	1,720[b]	150[c]	1,295	575

(a) 1957-63 excludes about 35,000 tons annually produced from imported crude oil; in 1964 excludes about 70,000 tons produced from domestic and imported crude oil
(b) Preliminary
(c) Includes a small quantity of refined sulphur

Source: Canadian Minerals Yearbook and various publications of the D.B.S.

The Market

Sulphur and sulphur-bearing minerals and gases are used to produce sulphuric acid, sulphur dioxide and other chemicals containing sulphur, the first being by far the most important. Apart from its use in chemical processes, sulphur has only a few relatively minor applications. Thus the demand for elemental sulphur is almost entirely derived from the demand for chemicals into which it enters.

Sulphur competes directly with chemicals manufactured from other sulphur-bearing materials and with these other materials. As a reult, the size of the potential market for elemental sulphur cannot be estimated without taking into consideration the amount of sulphur contributed by other sulphur-bearing materials.

Taking into account the elemental sulphur consumed, the sulphur content of the pyrites and smelter gases used domestically and the sulphur extracted from refinery wastes, it seems that the equivalent of about 950,000 tons of sulphur was consumed annually in Canada

in the past few years. In 1963, elemental sulphur, domestically produced and imported, contributed more than one-half of this total, smelter gas about one-third and pyrites the remainder.

Sales of Canadian elemental sulphur, derived almost entirely from natural gas, amounted to 1.2 million tons valued at $12.2 million in 1963. Of these sales, 821,000 tons, more than two-thirds of the total, were exported. Large quantities of sulphur were also imported during the year, about 151,000 tons, valued at $3.5 million.

The relative importance of sulphur and sulphur-bearing materials is shown in the following tabulation.

Sulphur and Sulphur-Bearing Materials Used in Canada,[a] 1961-63

	1961	1962	1963	1961	1962	1963
	'000 tons contained sulphur			% of total		
Elemental Sulphur						
Canadian	177	295	341	19	32	37
Imported	330	195	151	36	21	16
Total Elemental	507(a)	490(a)	491(a)	55	53	53
Smelter Gas Processed	277	293	311	30	32	34
Pyrites and Pyrrhotite	130	135	114	14	15	12
All Sources	914	918	917	100	100	100

(a) Excludes about 30,000 tons of elemental sulphur produced from refinery wastes

Source: Derived from various publications of the D.B.S. and the Canadian Minerals Yearbook

The rapidly changing status of domestically-produced elemental sulphur in Canadian use is apparent in the tabulation. The substitutability between elemental sulphur, pyrites and smelter gas is also suggested by the data.

Although elemental sulphur competes directly with pyrites and products manufactured from smelter gas, it is unlikely to displace these other materials entirely. The problems involved in disposing of smelter gases may lead to their continued and even expanding use, and the value of minerals that can be extracted from pyrites, as well as the availability of large quantities of this material, may be important considerations in their use.

For many years the pulp and paper industry has been the largest single user of elemental sulphur. In 1962, the industry consumed about 310,000 tons of sulphur, more than half of the total consumption reported in Canada in that year. The chemical industry was next in importance with more than 40 per cent of the total. In 1962, these two industries accounted for almost all of the estimated consumption.

The relative importance of the pulp and paper industry has dropped sharply since the mid-1950's when its consumption was about three-quarters of the total. This has occurred mainly because of the rapid increase of consumption of sulphur by the chemical industry.

Consumption of Elemental Sulphur by Selected Industries, 1955, 1960 and 1962

Industry	1955	1960	1962(a)	1955	1960	1962
	'000 tons			% of total		
Pulp and Paper	301	286	310	76.6	56.3	57.4
Heavy Chemicals	83	197	200	21.1	38.8	37.0
Misc. Chemicals	6	19	25	1.5	3.7	4.6
Rubber Goods	3	3	3	0.8	0.6	0.6
Other	1	3	2	0.3	0.6	0.4
Total Accounted For	393	508	540	100.0	100.0	100.0

(a) Partly estimated; includes elemental sulphur extracted from the refining of imported crude oils

Source: D.B.S., The Miscellaneous Non-Metal Mining Industry, Cat. No. 26-220

Consumption of Elemental Sulphur, by Region, Selected Years, 1953-61

	Atlantic Provinces	Quebec	Ontario	Prairie Provinces	British Columbia
			- thousand tons -		
1953	59	112	137	2	42
1957	66	135	175	58	48
1960	64	156	141	86	60
1961	68	157	154	70	57
		per cent of total consumption			
1953	16.8	31.8	38.9	0.6	11.9
1957	13.7	28.1	36.4	12.1	10.0
1960	12.6	30.7	27.8	16.9	11.8
1961	13.4	31.0	30.4	13.8	11.3

Source: D.B.S., The Miscellaneous Non-Metal Mining Industry, Cat. No. 26-220

In the early 1950's, about three-quarters of the consumption of elemental sulphur was in Quebec and Ontario. However, with the expansion of output in the Prairie Provinces and British Columbia and the consequent sharp reduction in the laid-down cost of the material, the West has been consuming an increasing proportion of the total. In 1961, Quebec and Ontario consumed about 60 per cent of the Canadian total, while the Prairie Provinces, which consumed less than one per cent in the early 1950's, used 14 per cent. The remaining 25 per cent was

divided between the Atlantic Provinces and British Columbia. In the Prairie Provinces the major uses of sulphur are for chemical and fertilizer production. In all other regions the use by the pulp and paper industry is more important.

Imports

Until 1956, almost all Canadian requirements of elemental sulphur were imported. However, although Canadian production has increased rapidly since 1956 and is now far in excess of Canadian demand, high costs of transportation are an obstacle to self-sufficiency. Users east of Manitoba have continued to be supplied to a large extent by imports from the U.S.A. while much of the sulphur produced in Alberta is exported.

The availability of large supplies of Canadian elemental sulphur has had a dual effect. Firstly, domestic production has displaced previously imported supplies, principally in the Prairies and British Columbia. Although this change has not been so rapid nor so striking in the Central Provinces, consumption of sulphur from western Canada in this important market region is increasing. The second effect has been to induce a substantial increase in the use of sulphur in the Prairies. In 1955, the Prairies and British Columbia consumed only 69,000 tons of sulphur, of which more than three-quarters was imported; in 1961, this region consumed 127,000 tons.

Imports of Sulphur by Region of Entry, Selected Years, 1955-63

	1955	1957	1959	1961	1963
			- thousand tons -		
Atlantic Provinces	64	73	61	65	43
Quebec & Ontario	252	312	258	258	107
Prairie Provinces	3	3	2	*	*
British Columbia	54	29	12	7	*
Canada	373	417	332	330	151

Source: D.B.S., s.c. 7300

Imports of elemental sulphur into Canada averaged about 370,000 tons annually in the period 1951-55 and constituted about 97 per cent of the consumption reported. In 1956, imports reached a peak of 474,000 tons and then declined; in 1963, they were 151,000 tons, a decrease of 323,000 tons from the peak and only about one-quarter of the domestic use during the year.

Imports into Canada have originated almost entirely in the U.S.A. Although there have been occasional importations from the United Kingdom, Mexico and France, these amounted to less than one per cent of the total in the ten years 1955-64.

Imports of Elemental Sulphur, Selected Years, 1951-64

	Quantity '000 tons	Value $'000	Unit Value $ per ton
1951	396	8,960	22.63
1953	359	8,527	23.74
1955	373	9,387	25.14
1957	417	9,752	23.39
1959	332	6,925	20.83
1960	329	6,629	20.16
1961	330	7,094	21.53
1962	195	4,638	23.77
1963	151	3,505	23.27
1964	150	3,475	23.23

Source: D.B.S., Trade of Canada, Imports, s.c. 7300

Exports

Before 1959, exports of sulphur were very small and exceeded 10,000 tons in only one year, 1957. Since 1959, they have increased very rapidly and amounted to 1.3 million tons in 1964, more than twice as much as was consumed domestically. Exports in 1964 were valued at $20 million. In 1964, Canada had a net export of sulphur of about 1.1 million tons compared with a net import balance of 305,000 tons in 1959, only five years earlier.

Exports of Elemental Sulphur, Selected Years, 1953-64

	Quantity '000 tons	Value $'000	Unit Value $ per ton
1953	5	107	23.04
1957	12	293	23.70
1959	27	505	19.04
1960	143	2,762	19.31
1961	218	3,968	18.21
1962	400	6,650	16.62
1963	821	11,972	14.58
1964	1,295	19,526	15.08

Source: D.B.S., Trade of Canada, Exports, s.c. 7630, 279-77

In 1960, all exports of sulphur were to the U.S.A., but by 1964 sulphur was also being exported to several Asian countries and to Australia, a trade which became relatively more important and which is expected to increase still further. In 1964, exports to the U.S.A.

were less than one-half of the total and to Australia, New Zealand and the Far East, 30 per cent of the total. The availability of export outlets for Canadian sulphur will become increasingly important as sales of natural gas and therefore production of elemental sulphur increases.

Exports of Elemental Sulphur by Principal Country of Destination, 1962-64

	1962		1963		1964	
	'000 tons	$'000	'000 tons	$'000	'000 tons	$'000
Benelux	6	62	-	-	-	-
Great Britain	11	218	19	280	30	375
U.S.S.R.	-	-	59	947	96	1,647
Australia	24	435	42	731	144	2,489
New Zealand	-	-	14	229	48	734
Japan	-	-	19	520	13	422
Taiwan	15	297	55	915	87	1,591
Other Asian	16	264	43	681	38	572
Rep. of S.Africa	-	-	32	509	35	578
U.S.A.	328	5,374	534	7,101	633	7,986
Other Countries	-	-	3	57	170	3,131
Total	400	6,650	821	11,972	1,295	19,526

Source: D.B.S., Trade of Canada, Exports, s.c. 279-77

Transportation

The cost of overland transportation limits the distance that sulphur from Western Canada can be delivered economically in competition with sulphur produced in the U.S.A. This situation confronts the producers in Western Canada both with regard to their exports to the U.S.A. and their sales in the important market areas of Central and Eastern Canada.

Competitive U.S. producers are situated principally around the Gulf of Mexico where they use the Frasch process to extract sulphur from underground deposits. Plants in this area generally ship sulphur to Eastern Canada by boat from Gulf ports. In 1963, 150,566 tons of imported sulphur were entered in Eastern and Central Canada, of which 140,725 tons, or 93 per cent, were accounted for by water shipments.

Canadian sulphur is shipped in both solid and liquid (molten) form. The molten sulphur is shipped in specially designed, insulated tank cars, each having a maximum capacity of 70 tons. Sulphur in solid forms is shipped in bulk in box cars and open gondola cars. These also have capacities of up to 70 tons of product.

Canadian rail rates for sulphur were reduced in 1961, and the rate structure is likely to undergo further changes as the volume of traffic increases. Rate concessions that have already been made have

enabled Canadian producers to sell competitively in many parts of Central Canada and to compete in Asia and in some U.S. markets.

In 1961, Canadian rates from Alberta to Vancouver were reduced from $9 to $7 per ton. An authoritative British journal made the following comment at that time: "...at current ocean freight to the Far East and India and loading charges at Vancouver ($1.37 per long ton) Canadian producers can now expect to realize $10. to $13. per ton ex-works."[1] The rail rate from Calgary to Chicago was also reduced in 1961 thus facilitating access of Canadian sulphur to one of the largest market areas in the U.S.A.

Suppliers located at Gulf ports in the United States have a freight advantage to almost all major consuming destinations in Canada east of Manitoba and in the U.S.A., except parts of the Northwest. This advantage is not as large in the mid-west and sulphur from Canada has been able to enter this market.

Sulphur Freight Rates from Alberta and Gulf Ports to Selected Destinations in Canada and the U.S.A., as at August, 1962

Destination	Origin of Shipments: Gulf Ports by rail[a]	Gulf Ports by water	Alberta[a] by rail
	$Can. per ton of 2000 lb.		
Seattle, Wash.	21.33	..	12.30
San Francisco, Calif.	..	..	15.20
Los Angeles, Calif.	..	..	17.80
Duluth, Minnesota	16.16	..	11.50
Chicago, Illinois	12.39	..	11.50
Detroit, Michigan	..	3.36[b]	11.50
Vancouver, B. C.	..	3.36[b]	7.00
Fort William, Ont.	..	..	11.40
Toronto, Ont.	20.04	..	15.09
Montreal, Que.	21.98	4.09	15.09
Three Rivers, Que.	23.06	4.09	..
Dalhousie, N. B.	..	4.09	..
Halifax, N. S.	24.57	4.09	..

(a) Minimum weights vary but are generally 100,000 to 140,000 pounds
(b) By barge, up the Mississippi

Source: C.P.R. and C.N.R., correspondence with District Freight Agents and shipping companies

(1) Sulphur, The British Sulphur Corporation Limited, June 1961, p. 2

Canada in Relation to the World Market

The majority of the companies producing sulphur in Canada are also engaged in the production of petroleum and sulphur in other countries and their operations are spread throughout the world. Most of these companies are based in the U.S.A. and have large interests in that country, but European companies are also involved in the production of sulphur in Canada.

Estimated Production of Elemental Sulphur by Major Producing Countries, 1961-63

	1961	1962	1963
		'000 tons	
U.S.A.	7,096	6,636	6,528
Mexico	1,374	1,596	1,712
France	1,210	1,488	1,563
Canada	395	668	1,392
U.S.S.R.	1,120	1,187	1,064
Poland	146	221	339
China	269	269	269
Japan	276	256	244
E. Germany	129	129	132
W. Germany	93	102	95
Others	524	489	829
Total	12,630	13,041	14,167

Source: U.S. Minerals Yearbook

The world's production of elemental sulphur is concentrated in North America, particularly in the United States. In 1963, North America accounted for more than 68 per cent of the world's estimated production and the U.S.A. alone for 46 per cent of the total. Although the U.S.A. is also a very large consumer of sulphur, it has been the world's leading exporter, with exports of $1\frac{3}{4}$ to two million tons of elemental sulphur annually.

Early in 1962 the capacity of Canadian plants passed two million tons of sulphur annually, and production during that year exceeded one million tons. It is estimated, on the basis of present gas contracts, that production will double in the next few years.(1) Even if Canadian producers captured all of the domestic market, it is unlikely that Canadian consumption would absorb more than one-third of this amount. Therefore, it appears that before the end of the present decade Canada will require an export market for at least $1\frac{1}{2}$ million tons of sulphur annually. Such a volume of exports would make Canada one of the world's largest exporters of sulphur, after having been one of the world's largest importers less than ten years previously.

(1) Canadian Minerals Yearbook

Pricing Policy and Prices

Sulphur prices in the U.S.A. are quoted for long tons of 2,240 pounds, f.o.b. mines; Canadian prices are quoted similarly, f.o.b. extraction plant. Delivered prices vary with costs of transportation, and freight equalization is carried on.

Prices of Sulphur in the U.S.A., 1952-65

Crude, Domestic, Bright, Bulk, f.o.b. Cars, at Mines

	High	Low
	$U.S. per long ton	
1952	21.00	21.00
1953	25.50	21.00
1954-56	26.50	26.50
1957-64	26.50	23.50
1965(May)	25.50	25.50

Source: Oil, Paint and Drug Reporter

Price stability has been a feature of international sulphur markets in recent years. As the report entitled "Canada and International Cartels" notes, this was also a feature of earlier years.

> "The elimination of competition in world markets and the control possessed by the two principal American producers permitted the price of sulphur in the United States to be maintained, regardless of business conditions, at practically a fixed level of $18 per ton for seventeen years prior to 1938. The price was then lowered to $16 per ton, which became the new fixed level. In times of good demand the fixed price produced very large profits for the two members of Sulphur Export Corporation. Average annual profit on investment over a period of about two decades was reported to be more than 13 per cent in the case of one company and almost 29 per cent in the case of the other."(1)

A recent publication of the Research Council of Alberta states:

> "Alberta sulphur attempting to find its way into overseas markets will have to compete not only with Mexican sulphur but also with the United States Frasch producers acting in concert. Under the terms of the Webb-Pomerene Act, United

(1) Canada and International Cartels, An inquiry into the Nature and Effects of International Cartels and other Trade Combinations, Report of the Commissioner, Combines Investigation Act, Ottawa, October 10, 1945

States companies are permitted to form a single corporation within an industry to transact business in export markets. In mid-1958 the four United States Frasch producers re-established the Sulphur Export Corporation..."(1)

Canadian posted prices for sulphur are apparently unreliable indicators of actual prices. The same publication states:

"In addition to apparent non-price competitive factors, there are special hidden inducements and concessions which are offered to sulphur users. It is known commonly that few sulphur consumers pay the posted price of sulphur. Hidden concessions may take the form of freight rebates or construction cost allowances."(2)

A British publication notes that:

"Posted prices still only apply in a small number of protected marketing areas and the bulk of domestic and export sales are based on delivered prices embodying freight contributions or other discounts of up to $3.50 per ton."(3)

Prices in Canada are based on U.S. prices and it appears that the practices followed in the U.S.A. have generally been adopted. The following quotation indicates that freight absorption is common in Canada as in the U.S.A.

"Delivered prices embodying freight charges vary considerably throughout the large area of the market which extends over Alberta, British Columbia and U.S. Northwestern and Pacific states. In 1959 the average value of sulphur production was reported at $19.35 per short ton. Preliminary estimates for 1960 indicate that the average may well be as much as $2 lower. According to the annual report of Jefferson Lake Petrochemicals of Canada Limited the average gross sales revenue - less freight and handling charges - was $14.90 per short ton, $2.07 less than in 1959."(4)

An analysis of the returns to producers in Alberta from sales of sulphur indicates that price concessions of various kinds are substantial; returns from sales in 1961 varied from $10.73 to $12.87 per long ton while the posted price was $23.50 per long ton, at plant.

As noted below, returns to Alberta producers, at plant, in 1961 were $10.73 to $12.87 per long ton. Exports in that year were only 218,000 tons, and the accumulated stockpile was increasing rapidly; in 1962 it was estimated at about 800,000 long tons and in 1963 at about one million long tons. However, in 1964 world consumption rose by 10.6 per cent and shortages began to appear. The world demand for sulphur persisted at a high level and between mid-1964 and mid-1965

(1) W.G. Brese, An Analysis of the Sulphur Industry in Alberta, Research Council of Alberta, 1962, p. 48
(2) Same, p. 48
(3) Sulphur, The British Sulphur Corporation Limited, April 1961, p. 14
(4) Same, p. 14

there were a series of price increases for Canadian sulphur. Effective July 1, 1965, the export price of Canadian sulphur was posted at $U.S. 35.20 a long ton, f.o.b. Vancouver. This would be equivalent to $Can. 27.75 per long ton, net return at plant, after making allowances for freight to Vancouver, loading and handling. Exports in 1964 may have been about 1.3 million tons and there appears to be no easing of the current shortage of sulphur.(1)

Returns to Alberta Producers from Sales of Sulphur, 1961

	Delivered Price	Loading Cost (Bulk) Sulphur)	Rail Tariff	Dock Handling	Ocean Freight	Return from Sales
	- dollars per long ton -					
To Great Lakes Region, Canada	29.00	1.25	16.35	-	-	11.40
To U.S.A.						
Midwest	27.00	1.25	12.88	-	-	12.87
Northwest	26.00	1.25	13.78	-	-	10.97
California	32.00	1.25	18.35	-	-	12.40
Overseas						
Australia	30.00	1.25	7.84	1.18	9.00	10.73
India	33.00	1.25	7.84	1.18	10.00	12.73

Source: W.G. Brese, An Analysis of the Sulphur Industry in Alberta, Research Council of Alberta, 1962, p. 55

Tariff Considerations

Most sulphur is entered under item 208, free of duty under all Tariffs. The part of this item which relates to sulphur is as follows: "Sulphur and brimstone, crude or in roll or flour." Some refined sulphur, particularly the precipitated form, is entered under tariff item 208t but some "flowers" of sulphur, a form of refined sulphur, was reported to have been entered under item 208. The refined forms of sulphur are classified under heading 28.02 of the Brussels Tariff Nomenclature and are discussed under that heading. Sulphur may also be entered duty-free under tariff item 791 when for the manufacture of pesticides.

At the public hearing in September 1960, two proposals were made to the Tariff Board with respect to elemental sulphur. The first was that the wording of the tariff item be changed to "Sulphur of all kinds, other than sublimed sulphur, precipitated sulphur and colloidal sulphur." This is the wording for heading 25.03 of the Brussels Tariff Nomenclature.(2) The second proposal was that existing rates of duty remain unchanged.

(1) Chemical Week, June 5, 1965, p. 45-8
(2) Transcript, Vol. 6, p. 979

No opposition was expressed with respect to either proposal.

Three producing companies made representations that the existing free entry for crude sulphur be continued.(1)

Company	Head Office	Location of Plants
British American Oil Company Limited	Toronto	Pincher Creek, Alta. Nevis, Alta. Rimbey, Alta.
Imperial Oil Company Limited	Toronto	Redwater, Alta.
Shell Oil Company of Canada	Toronto	Jumping Pound, Alta.

The proposal of the producers that sulphur continue to be entered free of duty was supported by the following consumers of sulphur.(2)

Company	Head Office
Electric Reduction Company of Canada, Limited	Toronto, Ontario
Niagara Brand Chemicals	Burlington, Ontario
Rubber Association of Canada	Toronto, Ontario
Canadian Pulp and Paper Association	Montreal, Quebec
Polymer Corporation	Sarnia, Ontario

The proposal by the Industry Committee for a new tariff item worded like B.T.N. heading 25.03 was consistent with the Committee's recommendations regarding the use of the B.T.N. for customs classification purposes. The forms of sulphur which would be excluded are classified in the B.T.N. under heading 28.02.

Two major reasons were given in support of the proposal that sulphur continue to enter free of duty. The first was that, even if the whole Canadian market were reserved for Canadian sulphur, Canada's exportable surplus would continue to grow rapidly. The imposition of a duty would not change this. In fact such action might invite retaliation and jeopardize the free entry of Canadian sulphur into other countries, particularly the U.S.A. The second reason was that the imposition of a duty on sulphur would affect the cost of sulphuric acid, the most extensively used chemical in Canada, and thereby increase the cost of producing fertilizers, chemicals and other products in Canada.

Although consumption of sulphur in Canada has increased during the past decade, the growth has been slow relative to the increase of production and productive capacity in Canada. In 1964, domestic disappearance was 575,000 tons compared with 452,000 tons in 1959, an increase of 123,000 tons. In contrast, Canadian plants shipped only 146,000 tons of elemental sulphur in 1959 and 1.7 million tons in 1964 and are expected to produce more than 2 million tons annually by 1970.

(1) Transcript, Vol. 6, p. 962, 971, 979
(2) Same, Vol. 6, p. 973, 977, 980; Vol. 85, p. 13006;
Vol. 89, p. 13501

Therefore, it seems reasonable to assume that Canada will have a growing exportable surplus of elemental sulphur in the coming years. However, because of transportation costs, imports of sulphur into Central and Eastern Canada may continue even while large amounts are being exported from Western Canada to the U.S.A. and abroad. Imports, almost entirely into provinces east of Manitoba, declined from 332,000 tons in 1959 to 150,000 tons in 1964.

If imports of sulphur were dutiable, producers in Alberta might be in a position to increase their share of the market east of Manitoba. However, in 1962, the freight disadvantage of Alberta producers in a large part of Central and Eastern Canada was $11 a ton or more at a time when the posted price of sulphur in the U.S.A. was about $21 a short ton. Therefore, it would require a very substantial rate of duty to offset this freight disadvantage. Even if Canadian producers were successful in displacing all imported sulphur east of the Lakehead, the problem of marketing very large quantities of sulphur outside of Canada, particularly in the U.S.A., would remain.

Furthermore, such a rate of duty could be expected to result in higher costs to the pulp and paper and chemical industries, the principal consumers in Canada. This possible increase in cost was quite naturally a matter of concern to the consumer interests who supported retention of duty-free entry of elemental sulphur.

CHLORINE AND CAUSTIC SODA - B.T.N. 28.01 and 28.17

INTRODUCTION

Chlorine and caustic soda are products of the same process of manufacture and are produced in a fixed ratio to each other. For this reason, the two products are treated together in this section. Hydrogen, a by-product of chlorine-caustic soda production, is dealt with in the section on industrial gases; in the chlor-alkali industry it has little or no commercial significance to most manufacturers. Hydrogen chloride, which is produced by some chlor-alkali plants, is dealt with under heading 28.06.

Chlorine and caustic soda are two of Canada's most important industrial chemicals. It is estimated that sales of chlorine in Canada in 1964 had a value of $19 million and sales of caustic soda $26 million. Although these sales were very substantial, they represented just over one-half of the volume of chlorine and about two-thirds of the volume of caustic soda that was consumed in Canada; the remainder was used captively.

Production and captive use are concentrated in Ontario and Quebec, with the result that the regional distribution of total consumption is different from the regional pattern of commercial sales. Thus about 55 per cent of the chlorine consumption is in Ontario, but only 30 per cent of the commercial sales; on the other hand, although British Columbia accounts for only about 20 per cent of total consumption, nearly 35 per cent of the commercial sales are made in that province. For both chlorine and caustic soda, nearly 90 per cent of total consumption occurs in the three provinces of Ontario, Quebec and British Columbia.

The use of chlorine and caustic soda is heavily concentrated in the pulp and paper and the chemical industries. Together these industries consume about 95 per cent of the chlorine used in Canada and 85 per cent of the caustic soda; the pulp and paper industry alone uses about 55 per cent of the chlorine and about 40 to 45 per cent of the caustic soda.

Because both products have a relatively low value per unit of weight, transportation costs are an important factor in the extent and nature of the competition, both among Canadian producers and between Canadian and foreign producers.

Canada exports large quantities of chlorine, but very little caustic soda. Substantial quantities of both products are imported, mostly into the provinces west of Ontario. Almost all of the foreign trade in these products is with the U.S.A.

The Products and Their Manufacture

Chlorine

Chlorine exists either as a greenish-yellow gas or as a clear amber liquid. It forms a liquid at -40°C., at atmospheric pressure,

or at +15°C. and 5.7 atmospheres pressure. Chlorine is highly volatile, toxic and corrosive and must be handled with special care.

The principal use of chlorine in Canada is as a bleach and solvent in the pulp and paper industry. The other substantial use is in the manufacture of chemicals such as ethylene glycol, solvents, pesticides, plastics, refrigerants and propellents. It is also used in relatively small amounts in the manufacture of soaps, in the extraction of ores, in the chlorination of water supplies, and for many other purposes.

Chlorine for sale is placed in containers under pressure and is thus liquefied. Specially constructed tank cars of varying sizes, one-ton tank units, and 150-pound cylinders are used for storing and transporting chlorine.

Sodium Hydroxide

Sodium hydroxide, caustic soda or lye, in the anhydrous form, is a white solid occurring as deliquescent pieces, lumps or sticks. It absorbs water and carbon dioxide readily from the air. It is very corrosive and destroys organic tissue. The liquid solution has a relatively high freezing point which rises rapidly as the concentration increases. A 50 per cent solution freezes at 54°F.; a 73 per cent solution freezes at 144°F. These are the usual commercial concentrations.

The pulp and paper and chemical industries are the largest consumers of the product. Other important uses are for the production of viscose, rayon, cellophane, soaps, detergents, primary plastics and for petroleum refining.

Most of the trade in caustic soda is in the form of a 50 per cent solution, although a 73 per cent solution is also readily available. Some of the product is sold in the anhydrous form as a solid or flake. Containers normally used for the anhydrous forms are cans containing up to 25 pounds of product and steel drums containing 425 pounds of the flake and 740 pounds of the solid. The product in solution is ordinarily sold in specially designed tank cars, tank trucks and in 110 gallon drums.

The Process of Manufacture

In Canada, chlorine and sodium hydroxide are produced by electrolysis, from common salt (sodium chloride), in either diaphragm or mercury cells. In the diaphragm process the sodium hydroxide remains in solution; in the mercury process the sodium amalgamates with the mercury, sodium hydroxide being formed when the amalgam is passed through a water solution. The mercury is then re-cycled through the cells. In both processes hydrogen is produced.

The mercury cell yields a 50 per cent solution of caustic soda which is directly saleable. The diaphragm cell yields a 10 per cent caustic solution which is often used on site in further manufacturing processes. However, because costs of transportation are high relative to the value of the product, the 10 per cent solution is further concentrated if it is to be shipped. A small part of the out-

put is converted to a solid state and is marketed mainly as solid or flake caustic soda.

The process of manufacture by either method is continuous and is interrupted only for maintenance or overhaul of equipment. Capacity can be readily increased by installing additional cells for either process.

Salt, the principal raw material used in the production of chlorine and caustic soda, is introduced into the electrolytic cells as a water solution (brine). The electrolytic action breaks down the brine, releasing chlorine, caustic soda, and hydrogen gas in a fixed ratio to each other. Theoretically, for each ton of chlorine which is produced, there is also produced about 1.13 tons of caustic soda and 55 pounds of hydrogen (10,000 cubic feet). The theoretical yield from one ton of salt in solution is 1213 pounds of chlorine, 1368 pounds of caustic soda and 34.5 pounds of hydrogen gas. Faith, Keyes and Clark in "Industrial Chemicals" state that in diaphragm cells the typical yield of one ton of salt is approximately 1110 pounds of chlorine, 1257 pounds of sodium hydroxide and 31 pounds of hydrogen.

Because of the constant ratio of co-production, and because of the difficulties and the danger of handling chlorine and of storing or disposing of any excess, the demand for chlorine is a limiting factor to the production of the joint products. The output of chlorine normally cannot exceed the storage capacity represented by tank cars and cylinders. A spokesman for the companies which produce chlorine stated at the public hearing that:

> "only the most limited stationary storage for chlorine is available at the manufacturers' plants and, with one minor exception, none is provided by users. For reasons of safety, chlorine consumers draw their requirements directly from tank cars which may be moved in the event of emergency."(1)

The Industry

Chlorine and caustic soda production was started in Canada by the Canadian Salt Company at Windsor, Ontario, in 1912, and was expanded in 1920 through the construction of two captive plants by pulp and paper companies. The second merchant-producing plant was built in 1935 at Cornwall, Ontario by Canadian Industries Limited, and the third in 1938 by the same company at Shawinigan, Quebec. No new plants were built until after the second World War. The Windsor plant, which had been acquired by Canadian Industries Limited before the war, ceased operations in 1954.

Between 1946 and 1952 Canadian chlorine and caustic capacity was increased substantially by the construction of six new plants, and in the late fifties two more were built. At the time of the public hearing in 1960, 12 plants owned by 11 companies were producing chlorine and caustic soda in Canada. Five of these were located in Ontario, five in Quebec, and one each in Alberta and British Columbia. These plants had a nominal productive capacity of about 348,000 tons of chlorine and 395,000 tons of caustic soda annually.

(1) Transcript, Vol. 5, p. 800

Since the hearing and to the end of 1964, five new plants came into operation, at Trail and Nanaimo, British Columbia, Saskatoon, Saskatchewan, Dryden, Ontario and Dalhousie, New Brunswick. In addition, eight existing plants have been expanded. The additional capacity represented by all of the above is for 123,600 tons of chlorine and 139,500 tons of caustic soda. Thus, at the end of 1964 there were 17 plants owned by 14 companies producing chlorine and caustic soda in Canada, with an annual capacity of about 472,000 tons of chlorine and 535,000 tons of caustic soda.

Further expansion is also scheduled for 1965, according to trade reports, which will add another 110,000 tons annually of chlorine and 125,000 tons of caustic soda to the existing productive capacity. Thus by the end of 1965 Canadian productive capacity is expected to be for 582,000 tons of chlorine and 660,000 tons of caustic soda, an increase of two-thirds in the five years since the hearing. About 45 per cent of the new productive capacity is in Ontario and 43 per cent is in British Columbia.

Canadian Manufacturers of Chlorine and Caustic Soda, Plant Locations, Year Built and Annual Capacity in 1960

Company	Plant Location	Year Started	Annual Capacity Chlorine	Annual Capacity Caustic
			tons	tons
Quebec				
Aluminum Company of Canada Ltd.	Arvida	1947	29,000	33,000
Canadian Industries Ltd.	Shawinigan	1938	29,000	33,000
Cdn. International Paper Co.	Temiskaming	1920	4,000	4,000
Shawinigan Chemicals Ltd.	Shawinigan	1958	18,000	20,000
Standard Chemical Ltd.	Beauharnois	1949	40,000	45,000
Ontario				
Canadian Industries Ltd.	Cornwall	1935	39,000	44,000
Dow Chemical of Canada Limited	Sarnia	1949	88,000	99,000
Howard Smith Paper Mills Ltd.	Cornwall	1922	3,000	3,000
The K.V.P. Co. Ltd.	Espanola	1946	8,000	9,000
Marathon Corp. of Canada Ltd.	Marathon	1952	12,000	14,000
Alberta				
Western Chemicals Ltd.	Two Hills	1953	22,000	25,000
British Columbia				
Hooker Chemicals Ltd.	Vancouver	1957	36,000	41,000
	Total Canada		348,000 [a]	395,000 [a]

(a) The data for individual plants are as supplied in the submissions at the public hearing; subsequent information available to the Board indicated that the total annual capacity was of the order of 348,000 tons of chlorine and 395,000 tons of caustic soda

Source: Transcript, Vol. 5, p. 780-1; Vol. 13, p. 1860-1

Canadian manufacturers produce partly to meet commercial demand and partly to supply their own requirements of the chemicals. Of the 12 plants in production early in 1960, four produced almost exclusively for their own needs, four produced almost exclusively for sale and the remaining plants produced both for captive use and for sale in varying degrees. Out of the 12 plants in production in 1960, seven sold both chlorine and caustic soda and two others each sold only one of the products. The remaining three used all of their output. Of the five plants established since the hearing, two produce chlorine and caustic almost exclusively for sale, two produce almost exclusively for captive use and one sells most of its output to only one customer and might be regarded as essentially a captive plant.

The tonnage sold by individual plants varies considerably. In 1962 shipments of chlorine ranged between 5,500 and 20,000 tons for six plants and from 28,000 to more than 40,000 tons for each of four others. In the case of caustic soda, three producers shipped 11,000 tons or less during the year, two shipped from 20,000 to 35,000 tons, and four shipped more than 45,000 tons each.

Transportation and Storage

The location of suppliers in relation to consumers of chlorine and caustic soda is the most important single factor in determining the degree of competition between suppliers. Transportation costs are particularly important in selling to pulp and paper companies, many of whom are long distances from chlor-alkali plants. For example, it is estimated that pulp and paper manufacturers paid an average of $20.50 per ton for transportation of chlorine purchased in 1959. This is 30 per cent of the base price of $69 per ton, f.o.b. producing plant. Freight is a slightly higher percentage of the base price for caustic soda.

A large proportion of the chlorine which is sold in Canada is shipped in tank cars; the 55-ton size represented 76 per cent of total tank car capacity in 1960 and the 30-ton car, 21 per cent of capacity. No data are available regarding use of cylinders, but these would represent only a small fraction of the sales of chlorine. It is probable that the situation would not be much different in 1964.

Chlorine and Caustic Soda, Tank Car Capacity, Canada, at December 9, 1960

	Capacity of Car				
	16-ton	30-ton	55-ton	15-ton[a]	Total
Number	23	115	225	5	368
Total Capacity (tons)	368	3,450	12,375	75	16,268
Per cent of capacity	2.3	21.2	76.1	0.5	100.0

(a) Fifteen one-ton containers mounted on one car

Source: Annual Report of The Chlorine Institute, Inc., 1960, p. B-8

Tank cars are rented by producers for varying periods, ten years being common, at a cost, in 1960, of $225 a month for a 55-ton car. This cost is included in the price of the product to buyers. No data are available regarding Canadian experience with the time taken for a round trip, but if experience in the U.S.A. is representative of the Canadian situation, tank car rental is an important element of cost.

If Canadian round trips for 55-ton tank cars averaged approximately 23 days, as in the U.S.A., the cost on the basis of $225 per month would be about $3.00 per ton of chlorine, or five per cent of the price, f.o.b. plant, in 1965. Experience in the U.S.A. indicates that the time consumed in a round trip for a 30-ton and 16-ton tank car is appreciably longer; hence the cost per ton would be greater for these, even taking into account lower rental charges for the smaller-capacity tank cars.

Neither manufacturers nor consumers ordinarily provide storage facilities for chlorine. When produced, the product is placed directly into tank cars or cylinders and these constitute the storage capacity at the producers' and consumers' premises. Tank cars provide an additional safety factor because they can be moved in case of accident. Tank cars carrying chlorine do not incur demurrage charges.

Problems of shipping caustic soda differ somewhat from those for chlorine. No particular problem is encountered when shipping anhydrous caustic soda (flake, solid or other form) although the weight of the steel drums in which the product is shipped is part of the total weight on which freight charges are paid. It is when caustic soda in solution is shipped that difficulties can arise.

Liquid caustic soda is highly corrosive and is shipped ordinarily in tank cars or tank trucks with special linings. The freezing point of the solution is relatively high so that tank cars designed to carry the material must be insulated and be provided with steam coils to facilitate unloading should the outside temperature be such that the product arrives at its destination in a frozen state. The freezing point rises rapidly as the concentration increases. The 50 per cent solution freezes at 54°F.; the 73 per cent solution freezes at 144°F.

Caustic soda can be stored in steel tanks, and tank cars are usually unloaded on arrival. After 48 hours caustic soda tank cars incur demurrage charges which are assessed against the buyer. Caustic soda is normally stored as a 50 per cent solution; when the 73 per cent solution is purchased, it is diluted at the time of the unloading. Dilution with water generates considerable heat so that storage tanks usually have provision for cooling if they are designed to be used for the dilution of the more highly concentrated solution.

Freight Equalization and Base Prices

In Canada, chlorine and caustic soda are normally sold f.o.b. producer's plant, freight equalized. The f.o.b. price is known as the "base price". In ordinary practice, the delivered price to a consumer is the price at which he can buy the product inclusive of

freight from his nearest supplier or the one from whose plant freight charges are lowest. Sellers, whose shipments incur higher freight charges, absorb the difference in freight costs. This practice is known as "freight equalization". Thus a buyer of chlorine or caustic soda can choose between alternative suppliers in the knowledge that his delivered cost will not be more than if he had purchased the product from his nearest supplier. This system of base prices and freight equalization is also used in the U.S.A.

In Canada, freight equalization is practiced both against domestic and foreign competitors, duty, duty drawback and the exchange rate entering into the calculation as circumstances warrant. At the public hearing it was stated that:

> "Where the factor of duty drawback permits the user to obtain United States chlorine at lower prices than he would normally pay for domestic material, the Canadian producers have to equalize on United States prices to secure business which would qualify for drawback. This is simply a price equalized on the most favourably located United States source, taking into account the United States price, United States and Canadian exchange rates, and relative freight costs."(1)

The practice of freight equalization has a direct influence on the returns received by the manufacturers. The following situations are illustrative.

Canadian suppliers at three locations, Beauharnois, Cornwall and Sarnia have contracted with the railways for agreed charges on chlorine shipped from their plants to Merriton, Ontario. The agreed charges in 1962 were $22.80, $18.40 and $12.60, respectively, per ton of chlorine. Assuming that the suppliers at these locations observed a base price of $69 a ton of chlorine, and setting aside for the moment foreign competition, the Sarnia manufacturer would receive $69 a ton, f.o.b. his plant; the one at Cornwall would absorb the difference in freight between $18.40 and $12.60 and would accept a return of $63.20 a ton at plant, while the producer located at Beauharnois would accept $59.80 a ton in order to compete. In all cases the delivered price to customers at Merriton would be the same, namely $81.60 per ton of chlorine, this being the base price of $69 plus the freight of $12.60 a ton from the most favourably situated domestic supplier.

Similarly, chlor-alkali producers at Cornwall, Beauharnois and Shawinigan have agreed charges on chlorine shipped to Hawkesbury, Ontario of $7.40, $7.40 and $10 per ton, respectively. The delivered cost to Hawkesbury would be $76.40 per ton regardless of which plant supplied chlorine, but the Cornwall and Beauharnois plants would receive a return of $69 a ton at their plants, whereas the Shawinigan plants would absorb the difference in freight and accept a return of $66.40 a ton.

In the first example, complications can arise because the most favourably located suppliers are in the U.S.A. at Niagara Falls,

(1) Transcript, Vol. 5, p. 813-4

New York. In 1962, the freight rate from Niagara Falls to Merriton, Ontario was $10.70 a ton, $1.90 a ton less than from the most favourably located Canadian plant. If chlorine, used by customers at Merriton were entitled to either the drawback of 99 per cent of duty or duty-free entry, Canadian suppliers would adjust their f.o.b. plant prices in order to compete with the United States plant.

The base price for chlorine in the U.S.A., in December of 1961, was $U.S. 65 a ton, or $Can. 67.77 per ton to the purchaser in Canada. The delivered price at Merriton, for chlorine from the U.S.A. would be $67.77 plus $10.70, or $78.47 a ton compared with $81.60 from the nearest Canadian plant, and Canadian suppliers who wished to compete at this location would absorb this difference of $3.13 per ton, and reduce their return at plant by this amount.

If chlorine consumed at Merriton were not entitled to drawback or free entry, the situation would again be different. The M.F.N. rate of duty on such shipments is 20 p.c., so that the base price in the U.S.A. plus duty would be $Can. 81.32 per ton, and the delivered price at Merriton would be $Can. 81.32 plus $10.70, or $92.02 a ton compared with the delivered price of $81.60 per ton from the nearest Canadian supplier, an advantage of $10.42 a ton in favour of the Canadian manufacturer. In quoting $81.60 per ton delivered at Merriton, the Canadian supplier in effect takes advantage of a rate of duty of only 5 p.c. against the potential U.S. supplier.

As long as the price in the U.S.A. is $Can. 67.77 and the duty applies, the actual price which Canadian suppliers would ask would depend on the extent to which they were willing to compete with each other for the sales to customers at Merriton and the degree to which they followed the base price system. Because the nearest Canadian supplier has a clear advantage of $5.80 in freight charges over any other Canadian producer, he might try to obtain a return just under $74.80 per ton, f.o.b. plant, hoping that other Canadian suppliers would be unwilling to take less than the $69 base price, f.o.b. plant.

The situation is complicated to the extent that producers are prepared to accept less than the base price. There is evidence that, on some portion of their sales, they do absorb freight costs and accept a return of less than the base price for these sales, and the base price itself may not be adhered to. The extent to which a producer competes is therefore determined by whether he is prepared to accept a return at plant below the base price. This is greatly influenced by the location of his plant relative to the market and his costs of production, and the opportunity he has to sell the co-product.

The pricing of caustic soda is similar and also entails the use of base prices and freight equalization.

The Market

The Canadian market for chlorine and caustic soda has been expanding rapidly for many years. In 1964 Canada consumed 510,000 tons of chlorine and 604,000 tons of caustic soda, more than twice as much as was used in 1955, ten years previously.

At the base prices for these products consumption in 1964 would have a value of about $33 million for the chlorine and $37 million for the caustic, a total of $70 million for both products.

However, a large proportion of Canadian demand has always been satisfied by captive production. Typically around 45 per cent of chlorine output and 33 per cent of caustic production is captive. Using these proportions, it is estimated that commercial sales in 1964 were for approximately 292,000 tons of chlorine valued at $19 million and 424,000 tons of caustic soda valued at $26 million, for a total sales value of $45 million.

The Available Supply and Its Disposition, 1964

	Chlorine		Caustic Soda	
	'000 tons	$'000	'000 tons	$'000
Production	485	-	549	-
Imports	43	2,616	55 (a)	5,752
Total Supply	528	-	604	-
Less Exports	18	863	*	13
Domestic Use	510	-	604	-
Less Captive Use	218 (b)	-	180 (b)	-
The Commercial Market	292	19,000 (c)	424	26,288 (c)

(a) Basis 100% caustic soda
(b) Estimated
(c) Assumes average value of $65 a ton for chlorine and $62 a ton for caustic soda

Source: D.B.S., various publications and U.S. Imports for Consumption, FT-110

Domestic production has been by far the most important source of Canadian supplies of chlorine and caustic soda and in 1964 constituted more than 90 per cent of Canadian consumption of both products. Imports have been mainly into areas whose regional production was insufficient to supply the demand. During the ten years, 1955-64, Canada's use of chlorine has risen by 289,400 tons and of caustic soda by 304,900 tons. In the same period imports of chlorine have risen only slightly and imports of caustic soda have remained essentially unchanged.

Chlor-alkali production has been increasing at a very rapid rate and there appears to be a continuation of this strong upward trend. In the five years preceding the public hearing, 1954-59, Canadian output increased by almost 70 per cent; in the next five years, 1959-64, production rose by a further 72 per cent. During this decade there were no significant changes either in exports or imports of either product, the additional output being absorbed by domestic users.

Production, Imports, Exports and Domestic Disappearance of Chlorine and Caustic Soda, Selected Years, 1954-64

	Chlorine				Caustic Soda(a)			
	Prod.	Imports	Exports	Disapp.	Prod.	Imports	Exports	Disapp.
	'000 tons				'000 tons			
1954	167	32	3	196	199	66	*	265
1957	226	34	10	249	264	53	*	317
1959	282	27	17	292	341	36	1	376
1961	354	30	20	364	415	37	*	452
1962	379	32	25	387	432	53	*	485
1963	420	35	27	428	484	78	–	561
1964	485	43	18	510	549	55	*	604

(a) Basis 100% caustic soda

Source: D.B.S., various publications and U.S. Imports for Consumption, FT-110

Industrial Use

Chlorine is used mainly in the production of pulp and paper and chemicals. In 1963, these two industries accounted for 98 per cent of all of the chlorine used in Canada. The remainder was used mainly in soap manufacturing, in mining, and in the treatment of water supplies. Pulp and paper and chemicals also account for most of the Canadian use of caustic soda, 85 per cent of the total in 1963. Soaps and washing compounds, plastics and resins, petroleum refining and mineral processing account for most of the remainder.

In the pulp and paper industry chlorine is used principally in bleaching processes and as a solvent for lignin. In the chemical industry it is used in the production of many chemicals and related products, some of the more important of these being the glycols, which enter into the manufacture of anti-freeze compounds, surface coatings (alkyd resins), plasticizers, plastics and solvents. A large number of other products make use of chlorine as a material in the course of their manufacture, such as pesticides (DDT), herbicides, refrigerants and propellants.

Caustic soda is consumed in significant quantities by more industries than is chlorine. Although its major applications, as indicated above, are in the manufacture of pulp and paper and industrial chemicals, it is also used in quantity, in the manufacture of such products as cellophane, rayon and other cellulose fibres and materials, in the processing of starch and glucose, in iron and steel refining and in textile dyeing and finishing.

Because of the concentration of pulp and paper plants and of the chemical industry in Ontario and Quebec, in 1962, these two provinces accounted for two-thirds of Canada's chlorine and caustic soda consumption. British Columbia, the only other major consuming province used 23 per cent of the chlorine and 20 per cent of the caustic soda. Ontario is by far the most important consuming province.

Consumption of Chlorine and Caustic Soda by Industry, 1960, 1962 and 1963

	Chlorine 1960	Chlorine 1962	Chlorine 1963	Caustic Soda 1960	Caustic Soda 1962	Caustic Soda 1963
			thousand tons			
Industrial Chemicals	129	134	184	142	169	191
Soaps and Washing Compounds	4	5	5	21	25	22
Plastics, Synthetic Resins	*	*	*	15	15	15
Other Chemical Industries	*	1	1	5	5	6
Total Chemical Industries	133	140	190	183	214	234
Pulp and Paper Mills	175	211	230	161	220	247
Petroleum Refining	-	-	-	10 (a)	12 (a)	13 (a)
Mining	5 (a)	5 (a)	5 (a)	10 (a)	10 (a)	10 (a)
Municipal Waterworks	3 (b)	3 (b)	3 (b)	-	-	-
Miscellaneous (c)	-	-	-	28	22	25
Other Minor Uses	*	*	*	3	4	3
Unknown Uses (d)	9	28	-	17	3	29
Domestic Disappearance	325	387	428	412	485	561

(a) Latest available, 1960
(b) Latest available, 1959
(c) Includes synthetic textile mills and plastic fabricators
(d) By subtraction of known uses from calculated disappearance

Source: D.B.S., various publications

Consumption of Chlorine and Caustic Soda, by Region, 1962

	Chlorine '000 tons	Chlorine % of total	Caustic Soda '000 tons	Caustic Soda % of total
New Brunswick	18.3	5.1	20.2	4.2
Other Atl. Provs.	3.9	1.1	11.5	2.4
Quebec	50.1	13.9	101.9	21.2
Ontario	189.7	52.7	221.0	45.8
Alberta	14.2	3.9	24.5	5.1
Man. and Sask.	0.6	0.2	7.6	1.6
British Columbia	83.0	23.1	94.6	19.7
Canada	359.8	100.0	481.3	100.0

Source: D.B.S., Sulphuric Acid, Caustic Soda and Chlorine

As indicated earlier, a large part of Canadian requirements of chlorine and caustic soda are met by production for own use. In the five-year period, 1958-62, 45 per cent of the chlorine and 33 per cent of the caustic soda, produced in Canada, was used captively.

Some of the first plants in Canada were built by pulp and paper companies to supply their own needs. This practice has been continued; of the five plants built since 1960 two are essentially captive producers and one was established to supply the needs of one paper company. The two other plants are primarily merchant-producers.

Of the 17 plants in operation in 1964, five had been built by pulp and paper companies almost entirely for captive use; five had been built mainly by chemical manufacturers largely or partly for captive use, and seven were established primarily to produce for sale. One plant, included in the above, owned by the Aluminum Company of Canada, used all of the caustic soda it produced and sold the chlorine. Almost all of the captive use occurs in Ontario and Quebec. Only one plant west of Ontario might be regarded as a captive producer. The C.I.L. plant at Dalhousie, New Brunswick, the only one located east of Quebec, is a merchant-producer.

Captive Use[(a)] of Chlorine and Caustic Soda, Compared With Production and Domestic Disappearance, Selected Years, 1955-62

	Used Captively		Captive Use as % of Production		Captive Use as % of Domestic Disappearance	
	Chlorine	Caustic	Chlorine	Caustic	Chlorine	Caustic
	'000 tons					
1955	93	70	48	31	42	23
1957	118	87	52	33	48	27
1959	127	94	45	28	44	25
1960	146	109	45	29	45	26
1961	161	168	45	40	44	37
1962	157	145	41	34	41	30

(a) Production minus shipments

Source: Derived from various publications of the D.B.S.

The Commercial Market

The commercial market in Canada for chlorine and caustic soda is substantially smaller than total use because of the large quantities produced for captive use. Nevertheless, the size of the commercial market for these co-products ranks among the largest for basic chemicals in Canada. In 1964, the market for chlorine was about 292,000 tons and for caustic soda about 424,000 tons. Between 1955 and 1964 commercial sales of chlorine have increased from $7.9 million to $19.0 million, and those of caustic soda from $13.2 million to $26.3 million. Total sales in Canada of both products were valued at $21.1 million in 1955; in 1964, only ten years later, their sales had more than doubled and had an estimated value of $45 million.

Because relatively high costs of transportation tend to limit the distance that the two products can be shipped economically, the principal market areas in Canada are well defined. The market areas

are more clearly defined with respect to chlorine because it can be shipped only as a liquid, at relatively high cost. For caustic soda the boundaries are less well-defined because, as transportation costs mount, the 73 per cent solution can be shipped instead of the 50 per cent concentration, and thus the area of competition can be extended. The shipment of anhydrous caustic permits a further such extension.

Until recently Central Canada provided the largest commercial market for chlorine and caustic soda. However, consumption and merchant sales in British Columbia have been increasing very rapidly and by 1962 sales in that province were approximately equal to sales in Ontario and Quebec, combined. The importance of British Columbia as a commercial market area arises partly from the fact that there are no captive plants in the province and all requirements are purchased. For example, Ontario consumed more than twice as much chlorine in 1962 but purchased only two-thirds as much as British Columbia because so much of Ontario requirements is met by captive production.

Comparison of Consumption and Commercial Market, by Regions, 1960 and 1962

	Chlorine				Caustic Soda			
	Consumption		Commercial Market		Consumption		Commercial Market	
	1960	1962	1960	1962	1960	1962	1960	1962
	thousand tons							
Atl. Provs.	13	22	12	22	15	32	15	32
Quebec	52	50	33	26	92	102	76	57
Ontario	177	190	51	56	193	221	99	119
Total East	242	262	96	104	300	355	190	208
Prairie Provs.	15	15	15	15	32	32	33	32
B.C.	59	83	59	83	64	95	64	95
Total West	74	98	74	98	96	127	97	127
Canada	316	360	171	202	396	481	286	334

As is apparent from the above tabulation, Ontario, Quebec and British Columbia provide the major commercial markets for both chlorine and caustic soda. However, although the Prairies and the Atlantic Provinces purchase much smaller amounts annually, sales in these areas are nevertheless substantial. New Brunswick accounts for most of the use and sales in the Atlantic Provinces and Alberta is the principal market area in the Prairie Provinces.

In 1962, seven of the ten merchant-producers in Canada were located in Ontario and Quebec, one was in British Columbia and another in Alberta. In that year the Central Canadian plants supplied around 70 per cent of the Canadian-produced chlorine and caustic soda that was sold in the domestic market. Four of the seven Eastern merchant-producers were in Quebec and three were in Ontario.

The major purchasers from chlor-alkali plants, the pulp and paper manufacturers, are widely distributed and in many cases are

located at a considerable distance from suppliers. In general, pulp and paper plants tend to be located north of the major area of settlement from Gaspe to the Lake of the Woods, and along the coasts of New Brunswick and British Columbia. Most of the chemical plants and other industrial users of chlorine and caustic are situated in the southern parts of Ontario and Quebec.

The pulp and paper industry is by far the largest purchaser of the two chlor-alkali products. In 1962 this industry accounted for 86 per cent of all purchases of chlorine and 60 per cent of the purchases of caustic soda in Canada. The chemical industry, because it produces a large proportion of its use captively, accounted for only eight per cent of the sales of chlorine and eleven per cent of those of caustic soda. For chlorine, the soap and detergent industry and the mineral refining industry were also major purchasers; for caustic soda synthetic textiles, petroleum refining and mineral refining were the other large customers.

Potential Competition from the U.S.A.

Most of the suppliers in the U.S.A. who might sell chlorine and caustic soda to Canadian consumers are located close to the Canadian border. The plants that are nearest the British Columbia market are at Tacoma, Washington. Chlorine and caustic soda can be shipped by water, or by water and rail from Tacoma. The Hooker plant at Vancouver does not produce anhydrous caustic soda.

No plants in the U.S.A. are located close to the Prairie market and freight costs from potential suppliers in the United States are high. Those nearest the Prairie Provinces are at Montagüe, Wyandotte and Midland, in Michigan, and at Tacoma, Washington.

Eastern producers face competition mainly from plants which are located at Syracuse and Niagara Falls, New York. Companies at these locations have lower costs of transportation to parts of the industrial area of southern Ontario than either of the two nearest Canadian producers, the Dow Chemical Company at Sarnia, and Canadian Industries Limited at Cornwall. The plants at Wyandotte and Montague, Michigan, may also be potential suppliers to a few Ontario consuming centres.

An analysis of freight rates in effect in January 1963, from the most favourably located Canadian and United States merchant-producers to the major consumers of chlorine in Eastern Canada indicates that at three locations, Merriton, Thorold and Port Colborne, Ontario, suppliers in the U.S.A. had an advantage of $1.10 to $1.90 per ton; at all other major consuming points, Canadian merchant-producers had a freight advantage of from $1.80 to more than $30, per ton of chlorine. The average advantage was about $15 per ton, more than 20 per cent of the base price in the U.S.A. at that time (in Canadian funds).

For caustic soda in solution the situation was similar. West of the Lakehead, Canadian suppliers had a substantial freight advantage relative to U.S.A. suppliers at all but one location. East of the Lakehead, Canadian suppliers were at a disadvantage at two locations.

Canadian producers had a freight advantage at 54 of the 57 points which were included in the tabulation; at 35 of these the advantage was more than $20 a ton, anhydrous basis, or approximately 35 per cent of the base price in the U.S.A., in Canadian funds.

Chlorine and Caustic Soda, Numbers of Major Canadian Consuming Centres at which Canadian or U.S.A. Suppliers Had a Freight Advantage, January 1963

	Liquid Chlorine	Caustic Soda[a] In Solution	Caustic Soda[a] Anhydrous
	no. of consuming centres		
Canadian Advantage	28	54	14
Less than $5 per ton	2	3	2
$5 and under $10	6	10	5
$10 and under $20	15	6	3
$20 and over	5	35	4
U.S.A. Advantage[b]	3	3	4

(a) Calculated on basis of 100% caustic soda
(b) In all cases the advantage was less than $3.00 per ton

Source: Agreed charges and information supplied by railway companies

Foreign Trade

The use of caustic soda in Canada has been substantially larger than that of chlorine in every year. The ratio of disappearance was lowest in 1964 when 1.18 tons of caustic were used for each ton of chlorine and was highest in 1956 when 1.40 tons of caustic were used for each ton of chlorine. In the five-year period, 1960-64, average annual use was 503,000 tons of caustic soda and 403,000 tons of chlorine, a ratio of 1.25 to 1.00.

This pattern of use does not absorb the co-products in the same ratio in which they are produced. In the period, 1960-64, the apparent ratio of production, in Canada, averaged 1.15 of caustic to 1.00 of chlorine. On the basis of this ratio, if Canadian plants had produced enough caustic soda to supply the domestic demand, they would have produced more chlorine than the market in fact absorbed. Thus the lack of demand for chlorine appears to have limited the production of caustic soda, requiring either markets abroad for chlorine or the importation of caustic soda to supplement domestic production. The situation is further complicated by the regional patterns of production and use.

Canadian manufacturers supplied about 85 per cent of the chlorine and 87 per cent of the caustic soda that was sold in Canada, in 1964, a significant increase from 1955 when they supplied only about 70 per cent of the sales in Canada. In relation to total Canadian use, inclusive of captive production, Canadian-produced chlorine and caustic soda accounted for 90 per cent of domestic consumption. Imports have

always been a relatively small, but important, part of the supply of chlorine and caustic soda in Canada.

Canadian exports are essentially of chlorine; exports of caustic soda are negligible. The exportation of chlorine permits the production of additional amounts of caustic soda for the domestic market. However, regional patterns of production and use still make it necessary to import substantial amounts of chlorine and caustic to meet domestic requirements.

Canada's net imports (imports less exports) of chlorine are very small relative to commercial sales by Canadian manufacturers. In the five-year period 1960-64 imports of chlorine averaged 33,500 tons and exports 23,000 tons, annually. The net import balance was about 10,500 tons per year, less than one per cent of Canadian use. In the same period imports of caustic soda averaged 53,000 tons annually and exports were negligible.

Imports

Before 1945, imports of chlorine exceeded 6,000 tons only in 1933 and 1944; imports of caustic soda exceeded 7,000 tons only in 1922, 1924 and 1944. After the second World War Canadian use of both products expanded rapidly and in spite of the growth of plant capacity, imports have been much larger than in the earlier years.

Imports of chlorine rose from less than four thousand tons in 1945 to 38,000 tons in 1955 and then declined to about 23,000 tons in 1958. They increased again in the early 1960's and in 1964 were at their highest recorded level, 43,000 tons valued at $2.6 million. In 1964, imports constituted less than 10 per cent of Canadian use of chlorine.

Imports of caustic soda have followed a similar pattern. Expressed as 100 per cent caustic soda, they increased from six thousand tons in 1945 to a peak of 74,000 tons in 1956 and then declined to 31,000 tons in 1958. In 1963 they reached a record of 78,000 tons but declined again in 1964 when imports were 55,000 tons valued at $5.8 million, about nine per cent of Canadian consumption.

Canada's imports of chlorine originate only in the United States, principally because of the difficulties and danger involved in handling and transporting the product, and the consequent special facilities and costs involved. All of the chlorine is shipped in liquid form. Regulations require that it be shipped in specially constructed containers or tank cars, under carefully specified conditions. The precautions necessary in shipping chlorine practically rule out trans-oceanic carriage of the product.

Caustic soda may be shipped either in the anhydrous form or as a solution. Because of the relatively high cost of transportation, on the basis of sodium hydroxide content when the liquid form is shipped, the U.S.A. is the only source of imports in this form. Imports in the liquid form were 96 per cent of the total imports in 1964, in terms of caustic soda content. The remaining four per cent was in various forms of anhydrous caustic soda, imported almost entirely from the U.S.A.

Imports of Chlorine and Caustic Soda,
Selected Periods and Years 1931-64

Annual Averages	Chlorine '000 tons	Chlorine $'000	Caustic Soda[a] '000 tons	Caustic Soda[a] $'000
1931-40	4.3	185	5.2	314
1941-50	6.8	306	9.6	521
Annual				
1952	15.8	850	28.5	1,501
1955	38.0	2,159	73.3	4,121
1957	33.8	1,917	53.2	2,979
1959	26.6	1,492	36.0	2,103
1961	29.7	1,714	37.1	2,130
1962	32.5	1,973	53.1	3,211
1963	34.6	2,136	77.6	4,573
1964	42.8	2,616	55.2	5,753

(a) As 100% caustic soda

Source: D.B.S., Trade of Canada, Imports, s.c. 8303, 8350, 8352

Exports

Most of the available supplies of chlorine and caustic soda are consumed in Canada, but fairly substantial amounts of chlorine and very small quantities of caustic soda are exported. Almost all of the exports of chlorine go to the U.S.A. Most of the exports of caustic soda are also to the U.S.A. with only occasional shipments to other countries. The available information indicates that all exports of both chlorine and caustic soda are from plants in Ontario and Quebec.

Exports of Chlorine and Caustic Soda
Selected Years, 1952-64

	Chlorine '000 tons	Chlorine $'000	Caustic Soda '000 tons	Caustic Soda $'000
1952	14.2	610	6.6	521
1955	10.4	493	0.1	4
1957	10.5	624	0.3	19
1959	16.8	571	2.8	33
1960	24.5	1,016	3.2[a]	95[a]
1961	20.0	885	0.1[a]	19[a]
1962	24.9	1,233	*[a]	4[a]
1963	27.0	1,427	-[a]	-[a]
1964	18.3	863	0.3[a]	13[a]

(a) Imports into the U.S.A.; value in U.S. dollars

Source: D.B.S., Trade of Canada, Exports, s.c. 8355, 8385 and U.S. Imports for Consumption, FT-110

Regional Considerations

The regional characteristics of the major market areas have an important bearing on the nature of the trade in chlorine and caustic soda. For example, British Columbia had two plants in 1962, with a nominal capacity of approximately 43,000 tons of chlorine and 49,000 tons of caustic. Both market all, or virtually all, of their output. In 1962, B.C. consumed approximately 83,000 tons of chlorine and 95,000 tons of caustic soda. Even if the two plants had operated at capacity, the deficit in the province would have been 40,000 tons of chlorine and 46,000 tons of caustic soda. Because shipments from Alberta or Eastern Canadian producers would involve very high freight charges, British Columbia would import chlorine and caustic soda to the extent that local production failed to satisfy the province's requirements. The expansion of the Hooker Company's plant in late 1962 and the construction of a second plant at Nanaimo, in 1963, is likely to reduce the dependence of British Columbia on imports from the United States.

The Prairie region had only one plant in 1962 and, as in British Columbia, almost all of its output was sold. This plant had more than sufficient capacity to meet the demand for chlorine in the Prairie Provinces, but insufficient capacity for caustic soda. Moreover, because chlorine and caustic soda are produced in a fixed ratio to each other, if the plant had met all requirements of chlorine in this region, of 15,000 tons in 1962, it would have produced only 17,000 tons of caustic soda relative to a consumption in 1962 of about 32,000 tons. The deficit of caustic soda in that year was apparently met by importations from the U.S.A. and shipments from plants in Ontario and Quebec.

Producers in Central Canada have been in a somewhat similar situation. However, they have a market in the U.S.A. for surplus chlorine and this additional demand permits them to increase their output of caustic soda beyond the limit that would otherwise be imposed by the domestic demand for chlorine. In 1962 these exports amounted to almost 25,000 tons which permitted the production of an additional 28,000 tons of caustic soda.

Tabulations of imports by province of entry can be misleading if the province of entry is not the province where consumption occurs. However, the location of potential suppliers in the U.S.A. and the cost of shipping chlorine and caustic soda are such that when some provinces are combined into larger regions, use very likely occurs in the region of entry.

On the basis of these data it is evident that imports of chlorine are almost entirely, and of caustic soda largely, for use in British Columbia. During the five years, 1959-63, 97 per cent of the chlorine and 73 per cent of the caustic soda, imported into Canada, were entered in British Columbia.

Imports of chlorine, although a regular part of the market supply of Eastern Canada, take only a very small part of the market. In 1962 imports were less than one-half of one per cent of estimated total sales east of Manitoba. Eastern Canada is a large net exporter of chlorine. Imports into provinces east of Manitoba, in 1962 and 1963, were 41 and 3,500 tons, respectively, compared with exports of 25,000 and 27,000 tons in those years.

Imports of Chlorine and Caustic Soda, by Region of Entry, Selected Years, 1953-63

	Atlantic Provs.	Quebec	Ontario	Prairie Provs.	B.C.	Canada
			thousand tons			
Chlorine						
1953	-	*	0.2	0.1	20.1	20.4
1955	-	-	2.8	*	35.1	38.0
1957	0.4	-	1.2	-	32.2	33.8
1959	-	-	0.1	-	26.5	26.6
1961	-	-	0.1	*	29.6	29.7
1962	-	-	*	*	32.4	32.5
1963	-	-	3.5	-	31.1	34.6
Caustic Soda in Solution[(a)]						
1953	-	0.1	1.8	0.9	36.8	39.7
1955	3.9	0.2	14.0	0.6	45.2	63.9
1957	-	-	0.7	0.2	44.3	45.3
1959	-	*	3.3	0.1	29.3	32.6
1961	-	1.8	0.6	*	32.5	34.8
1962	0.4	2.8	9.8	*	37.9	50.9
1963	10.5	4.2	19.5	*	41.6	75.9
Caustic Soda, Anhydrous						
1953	*	*	3.0	0.3	0.7	4.1
1955	*	0.1	1.8	0.2	7.3	9.4
1957	*	0.1	1.1	3.8	3.0	8.0
1959	0.1	0.2	1.6	*	1.5	3.4
1961	0.1	0.1	1.1	0.5	0.5	2.3
1962	0.1	0.1	0.7	0.4	0.8	2.2
1963	0.1	0.1	0.3	0.4	1.0	1.7

(a) As 100% caustic soda; assumes 50% solution imported

Source: D.B.S., s.c. 8303, 8350 and 8352

The advantage of Eastern Canadian merchant-producers relative to those in the U.S.A. with respect to freight costs is such that competition for most of the Eastern Canadian market is amongst Canadian manufacturers. Only a few consumers in this region are so located that there is a cheaper haul from plants in the United States than from the nearest Canadian supplier. The import data indicate that the freight equalization and pricing policies of Canadian producers have been effective in retaining the market east of Manitoba for chlorine produced in Canada.

In 1962 imports constituted about seven per cent of the estimated commercial sales of caustic soda in the region east of Manitoba. More than 90 per cent of the imports were of caustic soda in solution; only about six per cent were of anhydrous caustic. All of the imports of caustic in solution and practically all of the imports of anhydrous caustic soda were from the U.S.A. Exports of caustic are negligible.

Until 1957 there was no chlor-alkali production in British Columbia and consumers in that province obtained almost all of their requirements from the U.S.A. Since 1957 and until 1963 there has been a chronic shortage of productive capacity in the province, in spite of the construction of one new plant and the expansion of the first one. British Columbia imported about 31,000 tons of chlorine and 43,000 tons of caustic soda in 1963.

In the Prairie Provinces consumption of caustic soda is about twice as large as that of chlorine whereas the production of the co-products is more nearly one to one. As a result the lack of demand for chlorine has been a restrictive influence on the output of caustic soda and caustic soda is imported from the U.S.A. and Central Canada to supplement the supplies available from the plant in Alberta.

Freight charges on liquid chlorine and caustic soda in solution make it unprofitable for producers in Quebec, Ontario and even in Alberta to compete in the British Columbia market either with the Hooker plant at Vancouver or with producers situated at Tacoma, Washington. As a spokesman for the chlorine producers stated, "Freight rates on chlorine preclude delivery of this material from Eastern Canadian producers to British Columbia consumers."(1)

For caustic soda in the anhydrous form the competitive situation is somewhat different, and producers in Eastern Canada and Alberta apparently can compete at some locations in British Columbia.

Price Trends and Returns from Sales

East of the Rocky Mountains the same base price for chlorine is in effect throughout the region; the same applies to caustic soda in solution. For anhydrous caustic soda this region is divided at the Lakehead with one base price in effect east and another west of the Lakehead.

Since 1957, when production started in British Columbia, and until at least 1962, base prices in that province were lower than in the rest of Canada. In 1962 they were $60 a ton for chlorine, $54 a ton for the 50 per cent caustic soda solution and $55 a ton for the 73 per cent caustic solution. In 1962, the comparable base prices east of the Rockies were $69 a ton for chlorine, $62 a ton for 50 per cent caustic and $64 a ton for 73 per cent caustic. Base prices east of the Rockies were approximately 15 per cent higher than in British Columbia.

Base prices of chlorine and caustic soda in solution have tended to remain stable over relatively long periods of time. For example, the base price for chlorine, east of the Rockies, remained at $69 a ton from 1957 to 1963. In 1964, it was reduced to $65 a ton. The base price for the 50 per cent caustic soda solution, the principal form in which the product is sold, has been unchanged at $62 a ton from 1957 until 1965. The 73 per cent solution has been priced at $64 a ton throughout this period.

(1) Transcript, Vol. 5, p. 812

Prices of caustic soda in solution are quoted on the basis of their content of 100 per cent caustic soda. That is, two tons of a 50 per cent solution will be shipped at the price quoted per ton (i.e. of 100 per cent caustic). Thus the difference in price between the 50 per cent and the 73 per cent solution reflects higher costs of processing and not the higher content of caustic soda.

Base Prices of Liquid Chlorine and Caustic Soda
f.o.b. Plant, Tank Cars, in Canada and the U.S.A.,
Selected Years 1954-65

	Canada[a]				U.S.A.[a]			
	Liquid Chlorine	Caustic Soda 50%	Caustic Soda 73%	Caustic Soda Flake[b][c]	Liquid Chlorine	Caustic Soda 50%	Caustic Soda 73%	Caustic Soda Flake[b]
	$ per ton				$U.S. per ton			
1954	67.00	56.00	59.00	89.00	58.60	54.50	56.50	83.50
1957	69.00	62.00	64.00	99.00	63.00	58.00	60.00	94.00
1959	69.00	62.00	64.00	106.00	63.00	58.00	60.00	104.00
1961	69.00	62.00	64.00	106.00	65.00	58.00	60.00	104.00
1963	69.00	62.00	64.00	110.00	65.00	58.00	60.00	104.00
1964	65.00	62.00	64.00	110.00	65.00	58.00	60.00	104.00
1965	65.00	62.00	64.00	110.00	65.00	58.00	60.00	104.00

(a) East of Rocky Mountains
(b) Carlots in drums
(c) East of Lakehead

Source: D.B.S., Canadian Chemical Processing and Oil, Paint and Drug Reporter

Because producers in Canada equalize prices against the most favourably located Canadian or U.S.A. supplier, price trends in Canada are similar to those in the United States. The delivered cost of chlorine or caustic soda from the most favourably situated U.S.A. supplier sets a ceiling on the returns obtainable by Canadian suppliers. However, most Canadian suppliers are more favourably situated relative to Canadian purchasers than are plants in the U.S.A. and the laid-down cost to the consumer in Canada is frequently less than this ceiling.

To the degree that suppliers adhere to it, the base price constitutes the maximum return on the product. Few plants, if any, are so located that they are not required to absorb some freight costs on a portion of their sales in order to compete with other Canadian or U.S.A. suppliers. Similarly, most plants are so situated relative to some consumers, that they could charge more than the current base price and still undersell all other suppliers who adhered to the base price, if they chose to do so. Thus, although base prices are indicative of the trend of prices, returns to producers per ton of product sold vary between producing plants and between sales from the same plant to different customers.

Tariff Considerations

All imports of chlorine into Canada are from the U.S.A. in the form of a liquid, under pressure, in specially designed tank cars or containers. Apart from end-use provisions of the Customs Tariff, chlorine is entered as an unenumerated product under tariff item 711, at rates of 15 p.c., B.P. and 20 p.c., M.F.N.

Caustic soda may be imported into Canada as a solution or in a number of anhydrous forms. The solution may be either a 50 or 73 per cent concentration, the 50 per cent solution being the usual strength imported. No differentiation is made in the Customs Tariff between the degrees of concentration, but the Tariff does differentiate between the solutions and the anhydrous forms, and between the weights of packages in which the anhydrous forms are imported.

	British Preferential Tariff	Most-Favoured Nation Tariff
Item 210a Caustic soda:-		
1. When in packages of not less than twenty-five pounds weight each ....per pound	1/5 cent	3/10 cent
2. When in packages of less than twenty-five pounds weight each	17½ p.c.	25 p.c.
Item 210c Caustic soda in solution	15 p.c.	17½ p.c.

Almost all of the anhydrous caustic soda imported into Canada is in packages weighing 25 pounds or more; drums containing about 400 pounds of the anhydrous material are the usual commercial size. Almost all imports of anhydrous caustic soda are from the U.S.A.; the very small remainder is imported from the U.K.

At the public hearings in September and November of 1960, five of the eight Canadian merchant-producers in operation at that time proposed that chlorine and caustic soda should be dutiable at rates of 15 p.c., B.P. and 20 p.c., M.F.N. They also urged that chlorine be classified in a tariff item which was "descriptive of the material rather than as an article otherwise unenumerated..."(1)

The companies making this proposal were:

Company	Plant Location
Canadian Industries Limited	Cornwall, Ont. Shawinigan, Que.
Dow Chemical of Canada, Limited	Sarnia, Ont.
Shawinigan Chemicals Limited	Shawinigan, Que.
Standard Chemicals Limited	Beauharnois, Que.
Western Chemicals Limited	Two Hills, Alta.

(1) Transcript, Vol. 5, p. 830; Vol. 13, p. 1877

The five merchant-producers above would account for most commercial sales of Canadian-produced chlorine and caustic soda, east of the Rocky Mountains. They did not include Hooker Chemicals Limited in British Columbia nor the Aluminum Company of Canada, Arvida, Quebec. Also not participating in the industry's presentation was one pulp and paper company which operates a captive plant but sells small quantities of caustic soda.

The Electric Reduction Company supported the rate proposal and urged specific provision for chlorine in the Customs Tariff through adoption of the Brussels Nomenclature system of classification.(1)

Support for the proposed rates of duty by the Naugatuck Chemicals Division of Dominion Rubber Limited was made conditional on the acceptance by the Tariff Board of recommendations which it would present for chemicals produced by the company. In the words of a company spokesman,

> "Naugatuck Chemicals raise no objection to the rates proposed for chlorine and asks for no special concession in that respect. However, if the Board does not accept those rates which are recommended [by the company for the products it makes] Naugatuck Chemicals would of necessity be forced to request a compensatory concession for chlorine and for other raw material requirements...We could not maintain our position as a manufacturer of chemicals in Canada if placed under a competitive disadvantage caused by higher duty rates on raw materials, unless we receive commensurate protection for the products which we make."(2)

The company's purchases of chlorine, if imported, would be free of duty under end-use item 791.(3) The company indicated that its purchases of chlorine were almost entirely from domestic sources.

Polymer Corporation also expressed an end-use interest in chlorine when imported for use in the manufacture of synthetic rubber. Tariff item 851 provides for free entry for materials imported for that use and Polymer urged that the provisions of item 851 be continued.(4)

Imports under concessionary items such as 791 and 851 have not been significant in recent years. In only two years of the ten from 1954 to 1963 were duty-free imports as much as one per cent of the total value of imports of chlorine. Drawback of duty for exports is likely to be a far more important factor in the price paid for this product than are the provisions for duty-free entry under concessionary tariff items.

The Canadian Pulp and Paper Association, representative of the major consumers of chlorine in Canada, appeared at the hearing to oppose the rate proposal of the chlorine producers. The position of the Association was that chlorine should enter Canada free of all duty,

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(1) Transcript, Vol. 6, p. 895
(2) Same, Vol. 6, p. 902
(3) Same, Vol. 6, p. 914
(4) Same, Vol. 89, p. 13501

or failing this, at a rate lower than that recommended by the chlorine producers. Its position was clarified in reply to the following comment and question:

> Q.: "I take it that, of course, your client is in disagreement with the rate proposal of 15 and 20 per cent. When you say they need no protection at all, I take it it is your client's submission that the rates ought to be zero and zero?
>
> A.: "Which is the most we can hope for, but that is our position under the existing situation."(1)

In a general statement, made earlier during the same hearing, a spokesman for the Consolidated Mining and Smelting Company of Canada Limited (Cominco) said:

> "Our company, as a chemical manufacturer, does not subscribe to the theory that there should be a duty on all chemicals that are produced in Canada. There are instances when we think there need not be a duty."(2)

Later, he added:

> "More particularly, the company submits:
>
> (i) that no recommendation should be made which is likely to cause reciprocal increase in duties by any country to which Canada's products are exported, and
>
> (ii) that no recommendation should be made ... which would have the effect of increasing the costs of production of the company or similar industry."(3)

At the time of the hearing Cominco was constructing a chlorine-caustic plant which came into operation early in 1961. The company's interest was both as a consumer of chlorine and as a merchant-producer of the product.

The Canadian Federation of Agriculture expressed an interest in chlorine for use in the manufacture of pesticides. The Federation urged that chemicals used in the manufacture of pesticides should be entered free of duty under all tariffs.(4)

The proposal by the five merchant-producers for rates of 15 p.c., B.P. and 20 p.c., M.F.N., for all forms of caustic soda, was supported by three companies which purchase it, Canada Packers Limited, Lever Brothers Limited and Swift Canadian Company Limited, Soap Division.(5)

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(1) Transcript, Vol. 6, p. 928
(2) Same, Vol. 5, p. 710
(3) Same, Vol. 5, p. 715
(4) Same, Vol. 110, p. 16631
(5) Same, Vol. 13, p. 1900

Electric Reduction Company also supported the rate proposal of the manufacturers for caustic soda.(1)

Consolidated Mining and Smelting,(2) Naugatuck(3) and Polymer(4) made the same representations with respect to caustic soda as they had for chlorine.

The Canadian Pulp and Paper Association, the major consumer of caustic soda, as of chlorine, strongly opposed the rates proposed by the five manufacturers. The Association urged that there be no increase in the rates of duty for chemicals used in the manufacture of pulp and paper.(5)

The Plywood Manufacturers Association of British Columbia opposed the chlor-alkali producers' rate proposal. The Association recommended free entry for caustic soda when it is imported for use in the manufacture of plywood.(6)

The Canadian Manufacturers of Chemical Specialties Association expressed its interest in caustic soda and requested that the existing rates of duty for the product remain unchanged.(7)

The Canadian Pharmaceutical Manufacturers Association listed caustic soda as one of the more important chemicals used by its members. It recommended that when they are made in Canada, chemicals used in the manufacture of pharmaceuticals should be dutiable at rates of 15 p.c., B.P. and 20 p.c., M.F.N.(8)

Thus, for chlorine the following rate proposals were before the Board. The five merchant-producers, supported by Electric Reduction Company and Naugatuck, urged that the existing rates of 15 p.c., B.P. and 20 p.c., M.F.N. be continued. The Pulp and Paper Association recommended free entry under the B.P. and M.F.N. Tariffs; Consolidated Mining and Smelting opposed any increase in rates; and the Federation of Agriculture and Polymer recommended free entry for specific end uses.

For caustic soda, the five producers were supported by Canada Packers, Lever Brothers, Swift Canadian Company, Electric Reduction Company, and Naugatuck, in their proposal for rates of 15 p.c., B.P. and 20 p.c., M.F.N. The Plywood Manufacturers Association urged free entry under both Tariffs; the Chemical Specialties Manufacturers, Consolidated Mining and Smelting and the Pulp and Paper Association opposed any increase; and Polymer and the Pharmaceutical Manufacturers proposed end-use treatment for specific end uses. Polymer recommended free entry and the Pharmaceutical Manufacturers rates of 15 p.c., B.P. and 20 p.c., M.F.N.

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(1) Transcript, Vol. 4, p. 679
(2) Same, Vol. 5, p. 715
(3) Same, Vol. 10, p. 1487
(4) Same, Vol. 89, p. 13501
(5) Same, Vol. 85, p. 13006
(6) Same, Vol. 14, p. 1947
(7) Same, Vol. 14, p. 1999
(8) Same, Vol. 87, p. 13321

The existing rates for caustic soda in solution, the principal form in which the product is sold commercially, are 15 p.c., B.P. and 17½ p.c., M.F.N. The proposal by the manufacturers would involve no change in the B.P. rate but an increase to 20 p.c. in the M.F.N. rate.

The existing rates for anhydrous caustic soda are 1/5 cent per pound B.P. and 3/10 cent per pound M.F.N., if in large packages. The large packages would account for virtually all of the trade in the product. In 1964 caustic soda, flake, was priced in Canada at 5.5 cents a pound. The ad valorem equivalents of the existing specific rates, at this price, would therefore be 3.6 p.c., B.P. and 5.5 p.c., M.F.N. The commercial trade in caustic soda in small packages is negligible. In packages weighing less than 25 pounds each, the rates are 17½ p.c., B.P. and 25 p.c., M.F.N.

Thus, for anhydrous caustic soda in larger packages, the Canadian producers were proposing substantial rate increases, from the equivalent of approximately 4 p.c., B.P. and 6 p.c., M.F.N. to 15 p.c., B.P. and 20 p.c., M.F.N. For the anhydrous form in small packages the rates proposed would involve decreases in both the B.P. and M.F.N. rates.

The public hearings on chlorine and caustic soda were held on different dates because the basic schedule was according to the order of headings in the Brussels Nomenclature. In the B.T.N. chlorine is classified under heading 28.01 and caustic soda under heading 28.17. However, because these are co-products of the same process of manufacture, some of the arguments presented for one product were repeated for the other, and other arguments in support of one would apply to both products. For this reason, arguments in support of the proposals for both products are dealt with together.

In support of maintaining the present rates of duty for chlorine at 15 p.c., B.P., 20 p.c., M.F.N., and of revising the rates for caustic soda to 15 p.c., B.P. and 20 p.c., M.F.N. for all forms and package sizes, the manufacturers claimed that costs of production and distribution in Canada were higher than in the U.S.A. and therefore that they required tariff protection in order to continue to operate profitably.

Their spokesman said that plants in the U.S.A. were about three times as large as those in Canada, on the average. He conceded that economies of scale were not so pronounced in chlor-alkali production as in the production of some other chemicals but nevertheless, that "Canadian producers do incur somewhat higher costs by reason of the smaller scale of their operations."(1) He said that whereas in large plants the hydrogen that is obtained may be sufficient to warrant its conversion into products such as ammonia, in smaller plants it was more likely to be burned as fuel.

The average size of plants in the U.S.A. is much larger than in Canada. However, there are in the U.S.A., plants no larger than those in Canada which are apparently able to compete successfully in their own market areas.

(1) Transcript, Vol. 5, p. 781

The spokesman for the Consolidated Mining and Smelting Company (Cominco) stated that the company was about to open a new chlor-alkali plant with an annual capacity of 7,300 tons of chlorine. This would be the third smallest plant in Canada, the only smaller plants having been built in 1920 for captive use by pulp and paper companies. In connection with this new plant the spokesman for Cominco said,

> "Mr. Hart [representing the chlorine producers] has placed such considerable emphasis on the economy of large scale operation as compared with small-plant operation and on the disadvantage of the Canadian producer as compared with those of the United States producer, that one might arrive at one of two conclusions in respect of our plant. I think one conclusion might be that there must be exceptions to the rule regarding the economies of scale. If this were not so then, of course, one conclusion would be that my company is unwise to enter into the highly competitive field of alkali production with a small plant. As to the latter conclusion I can only say we expect to make a profit, and we are spending $2,600,000 in the construction of the plant in anticipation of a reasonable profit."(1)

The merchant-producers also claimed that their costs of investment per ton of product were higher in Canada than in the U.S.A. Their spokesman said:

> "The cost of process equipment and ancillary service apparatus, which constitutes the bulk of this investment, is somewhat higher in Canada than in the United States. Since fixed investment in plant represents a substantial element of costs, this accounts, in part, for our costs being higher than we believe to be the case in the United States.
>
> "Canadian chlor-alkali plants are considerably smaller than most United States plants and this fact contributes to higher unit costs in Canada than are typical in the United States."(2)

The five producers also said that the existence of a tariff encourages the establishment of chlor-alkali plants in Canada. The spokesman for the group said:

> "if the duty were to be removed from chlorine ... it would be a very foolish manufacturer in these circumstances who would establish a plant in Canada to supply this growing market ... when he could equally obviously establish it across the border, having free access to our market and having at the same time an opportunity to take advantage of any market which there might be on the other side of the border."(3)

He also spoke of the threat of chlorine being dumped in Canada, to the detriment of Canadian merchant-producers, in the following terms:

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(1) Transcript, Vol. 6, p. 891-2
(2) Same, Vol. 5, p. 820
(3) Same, Vol. 6, p. 930

> "The character of chlorine precludes any but the most limited production for stock and chlorine cannot be discharged into the atmosphere or otherwise disposed. Accordingly, chlor-alkali plants cannot be operated beyond the demand for chlorine. If an extraordinary demand at a profitable level should develop in the United States for caustic soda, United States producers would be strongly tempted to unload surplus chlorine in Canada.(1)

The converse argument was used on behalf of caustic soda.

The spokesman for the merchant-producers said that it was anomalous that different forms of caustic soda should be subject to different rates and that the co-products of the same process of production, chlorine and caustic soda, be dutiable at different rates. In this connection, he said:

> "There appears to be no reason for the great discrepancy between the duties on anhydrous and liquid caustic soda or between those materials and the co-product chlorine ... It is a practice of fairly general application in the Canadian tariff that rates of duty are higher the more fully processed is the material. There appears to be no reason to reverse this practice in recommending rates of duty applicable to caustic soda. It is, of course, self-evident that production of anhydrous caustic soda involves additional processing of liquid caustic soda. It is surely unreasonable that this should entail loss of protection to the Canadian producer. This situation was, we suspect, wholly unintended and illustrates the inadvisability of applying specific duties.
>
> "Liquid caustic soda and chlorine are unavoidably co-products of a particular process of manufacture. It is this manufacturing operation which the customs tariff should be designed to encourage. There is nothing in the use patterns of the two co-products which justifies the application of different rates of customs to the two chemicals, and it is not the intention of the producers to argue that the additional processing involved in the production of anhydrous caustic soda should give rise to additional protection."(2)

The merchant-producers also claimed that Canadian costs were higher than in the U.S.A. because more plants in the U.S.A. are located over salt domes and because Canadian plants were thought to absorb more freight costs than those in the U.S.A.

The producers, who made the submission, did not attempt to measure the impact of each of the factors on their competitive position, nor to deal precisely with possible offsets such as their more favourable location in relation to most of the Canadian market, nor to measure the extent to which imports might be a normal supplement to Canadian production.

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(1) Transcript, Vol. 5, p. 826
(2) Same, Vol. 13, p. 1872-3

They did not indicate why a British Preferential rate of 15 p.c. was necessary, although neither liquid chlorine nor caustic soda in solution, the principal commercial forms, has been imported from Commonwealth countries, and imports of anhydrous caustic soda from Commonwealth countries are negligible. They also did not indicate why 20 p.c. was particularly appropriate for the M.F.N. rate, except that it had been generally effective. Their justification of uniform rates of duty, for all forms of caustic soda, was generally on the basis that this would "bring the rates in line with the existing and proposed rates on chlorine ... this simplification of the customs rate structure for the products of the chlor-alkali industry is sensible and justified."(1)

A spokesman for the Electric Reduction Company of Canada Limited, in explaining the company's support of the rate proposals for chlorine, made particular reference to the proposed rate of 15 p.c., B.P. He said:

> "We are supporting the general recommendations of the Industry Committee because members of the industry are attempting to work together as a body and trying to show solidarity. This is supported because it is not costing anything to any Canadian consumer, user, or manufacturer at the present time."(2)

A statement was made at the public hearing respecting caustic soda, on behalf of three manufacturers of soaps and detergents who supported the rates proposed by the caustic producers. It indicated that this support was not without some reservations. Their spokesman said:

> "we do not now object to the rates of 15 per cent B.P. and 20 per cent M.F.N. which are proposed for ... sodium hydroxide. This is not intended to imply that the soap companies are, or would be, indifferent to price increases in these important alkalis. We would hope and expect that the manufacturers would not take undue advantage of any additional duty to raise the price of these alkalis, but rather would use the tariff principally to maintain a sufficient differential between delivered costs of Canadian and foreign alkali in Canada to assure maximum use of the Canadian-made product."(3)

The soap and detergent manufacturers do not benefit either by duty-free entry or by drawback of duty on their imports of caustic soda.

Those who opposed the rates proposed by the merchant-producers did so generally on the grounds that tariffs affected their costs of purchased materials and lower rates of duty would allow them to compete more effectively both in the domestic and in export markets. The Canadian Federation of Agriculture and Polymer Corporation supported their recommendations in such terms, in general submissions. Neither the Canadian Pharmaceutical Manufacturers Association nor the Canadian Manufacturers of Chemical Specialties indicated why the rates they proposed were appropriate specifically for caustic soda.

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(1) Transcript, Vol. 13, p. 1875
(2) Same, Vol. 6, p. 897
(3) Same, Vol. 13, p. 1901

The Canadian Pulp and Paper Association did not make a formal submission to the Board at the hearings on chlorine and caustic soda. However, its spokesman took a very active part in opposing and questioning the arguments in support of the proposals of the chlorine-caustic soda manufacturers. The companies which were represented by the Canadian Pulp and Paper Association purchased about 50 per cent of the Canadian-produced chlorine and caustic soda which was sold domestically in 1959, and represented an even larger share of total use because of captive production by some of the companies. Most of the caustic purchased by pulp and paper companies is in the liquid form. The spokesman for the Association indicated that he was not making a recommendation with regard to anhydrous caustic soda because members were only minor users of that form of the material.(1)

The Plywood Manufacturers Association of British Columbia also opposed the proposals of the producers. The representative of the Association submitted that:

> "our industry is unable to absorb an increase in manufacturing costs and we therefore wish to record with you our strong opposition to any proposal that rates of duty on sodium hydroxide ... be increased over their current levels. Rather than an increase in the duties on these chemicals, we believe that they should ... be subject to a complete 'end-use' exemption similar to that provided for the resin by item 925 when it is imported for use in the manufacture of plywood."(2)

The interest of the plywood manufacturers appeared to be mainly in the anhydrous caustic.

The arguments which were presented either in opposition to the rate proposals of the merchant-producers, or on behalf of lower rates than those under the existing Tariff, are summarized in the following paragraphs.

The spokesman for the Canadian Pulp and Paper Association said that under the existing Tariff imports were negligible and there was no effective competition in Canada from foreign sources. He commented on the brief of the Canadian producers as follows:

> "As I read the brief you say you do not have any effective competition in Canada from foreign sources, that the imports are negligible, that were the duty of 20% [on chlorine] to be eliminated it would not affect more than a few of the users of chlorine in the pulp and paper industry."(3)

This argument was given emphasis in terms of plant location, as noted in the following paragraph.

A representative of the Plywood Manufacturers Association of British Columbia submitted that if there were no duty whatever, sup-

(1) Transcript, Vol. 14, p. 1964
(2) Same, Vol. 14, p. 1947
(3) Same, Vol. 6, p. 866

pliers located in the United States could compete in the Canadian market at only a very few consuming centres. He said:

> "the evidence that has been given by the chemical industry was that they really control and dominate the Canadian market for anhydrous sodium hydroxide, and the only place where they do not dominate and control the market are those few areas in Canada where, because of transportation costs, it is impossible for them to ship as cheaply as apparently American producers can ship."(1)

The spokesman for the pulp and paper industry noted that the existing duty on chlorine has little effect on imports. "The real problem ... of the chlorine producers is not on duty, but on freight which, if I understand their brief, is the situation now."(2)

Concern was expressed, by various interested parties, over the effect on their costs of higher rates of duty. The spokesman for the Plywood Manufacturers of B.C. commented on this point, as follows:

> "Markets for plywood are extremely competitive both at home and abroad. In Britain where there is no tradition of wood construction such as exists in North America, the competition from other types of building materials, and also from other types of plywood is intense.
>
> "We cannot afford an increase in our manufacturing costs. We would oppose most strongly a potential cost increase created by higher tariffs on chemicals which we must use to manufacture our plywood."(3)

It was claimed by consumers that the implementation of the rates proposed by the merchant-producers would enable them to exploit their position in the Canadian market to the detriment of consumers, even though producers did not take full advantage of the protection available. The plywood manufacturers' representative made the following comments on this:

> "I have listened to your statement that, if you were given the benefit of this great wall of protection, you would produce prices which were sufficiently attractive to induce the B.C. consumer to purchase from you. But, in point of fact, what you would be doing in my judgment ... is that you would be depriving them of their present right to purchase goods outside of Canada, and compelling them to purchase from you at prices you might fix."(4)

The representative of the pulp and paper manufacturers suggested that this would be particularly true whenever a shortage of one of the products developed. He pointed to a price spread of $13 a ton between the Canadian and the United States price of chlorine in 1953, as an illustration.(5)

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(1) Transcript, Vol. 14, p. 1965
(2) Same, Vol. 6, p. 926
(3) Same, Vol. 14, p. 1944-5
(4) Same, Vol. 14, p. 1933
(5) Same, Vol. 6, p. 927

As noted earlier, the chlor-alkali manufacturers' proposal for chlorine involved no change in the existing rates under tariff item 711, of 15 p.c., B.P. and 20 p.c., M.F.N.

For caustic soda, the substantive rates are those of tariff item 210c, because about more than 90 per cent of the recent imports are as a solution. The rates under item 210c are 15 p.c., B.P. and 17½ p.c., M.F.N. The producers' proposal therefore involves an increase in the M.F.N. rate to 20 p.c.

For the anhydrous form, in packages weighing less than 25 pounds each, the proposal represents a reduction in the rates from 17½ p.c., B.P. and 25 p.c., M.F.N. to 15 p.c., B.P. and 20 p.c., M.F.N. Such importations have been negligible. In recent years the specific rates of duty for anhydrous caustic soda have been equivalent to approximately 5 p.c., B.P. and 6½ p.c., M.F.N. Total imports of the anhydrous forms have constituted only a very small part of Canadian requirements of caustic soda.

Chlorine and caustic soda in solution are imported only from the U.S.A. Anhydrous caustic soda is imported mainly from the U.S.A.; small amounts are also imported from Britain. Imports from Britain have been between two and five per cent of the imports of anhydrous caustic; relative to total imports of caustic soda in all forms, imports from the U.K. are negligible.

Thus, the proposals of the merchant-producers were concerned essentially with the M.F.N. rates, which would apply to imports from the U.S.A. For caustic soda in solution their recommendation was for an increase from 17½ p.c. to 20 p.c.; for anhydrous caustic soda, for an increase in the effective(1) rate from about 6½ p.c. to 20 p.c. At the 1964 price in the U.S.A. of $Can. 112 a ton, the increase would be from $6 a ton under the existing specific rate to $22.40 a ton under the proposed ad valorem rate.

Evidence submitted to the Board indicated that the area of competition between producers in Canada and the United States is very limited. Imports of chlorine and caustic soda into provinces other than British Columbia have been in insignificant quantity. The substantial imports into British Columbia of both chlorine and caustic soda in solution have been necessary to supplement local production even after the erection and expansion of the Hooker Chemicals plant at Vancouver. Producers in Eastern Canada indicated that they could not compete effectively in this market because of their freight disadvantage. Only a small part of the market in British Columbia can be served by the new plant of the Consolidated Mining and Smelting Company at Trail, B.C. The evidence indicated that Western Chemicals Limited at Two Hills, Alberta, could not compete with imported chlorine and caustic soda in British Columbia. Thus, most of that market that is not supplied by the plant of Hooker Chemicals in Vancouver will draw upon supplies from nearby producers in the United States.

From the evidence submitted it appears that the most important factor governing the nature and extent of the competition between

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(1) The rate which would have applied to more than 95 per cent of the imports of anhydrous caustic in the five years, 1960-64

chlor-alkali plants is the freight cost incurred in getting the products to the buyers. As indicated earlier, the average freight cost of chlorine and caustic soda in solution in Canada is about $20 a ton, about 30 per cent of the base price at plant. Any savings that might be achieved in other elements of cost would have to be very substantial to overcome the advantages of favourable location. As the submission of the manufacturers noted:

> "High freight cost in relation to production cost has been and will probably continue to be an important factor in the establishment of small captive plants. For the companies consuming the bulk of the tonnage, freight is appreciably more significant than the level of customs duty".(1)

A question from the Board also elicited the following:

> "the advantage to the Canadian producer resulting from his location in relation to the location of most of his customers, which results in a great advantage over foreign producers of chlorine, is of greater significance than the tariff."(2)

Although the quotations above relate to chlorine they would also apply to caustic soda in solution.

Suppliers in the United States appear to have an advantage in freight costs for chlorine at only three Canadian consuming centres of consequence, and for caustic soda in solution at only three locations. At all of these locations, the advantage to the United States producer is $2 or less per ton. At other important Canadian consuming centres the freight advantage of Canadian plants is substantial. For chlorine, the freight advantage to Canadian producers in market areas accounting for three-quarters of domestic sales, varied between $5 and $30 per ton, and was more than $10 per ton for 40 per cent of estimated sales. Canadian producers had a freight advantage of from $5 to more than $50 a ton for liquid caustic soda at 51 of 57 major consuming centres, and an advantage of $10 a ton or more at 41 of the 57 centres.

For anhydrous caustic soda the situation is different. In 1964 the price of the anhydrous flake in Canada was $110 a ton; the price of the 50 per cent solution was $62 a ton, dry basis. Although it would cost $48 more per ton, on the basis of caustic soda content, to use the anhydrous form, at some locations and in some circumstances it is the more economic. The anhydrous form appears to be used, generally, by consumers whose requirements are small. For use in small amounts the anhydrous form is more convenient than the liquid form. It is important to note that although the 50 per cent solution is sold on a dry basis, freight would have to be paid on two tons of product to equal one ton of anhydrous product.

Imports of anhydrous caustic soda have supplied only a very small part of the commercial market, British Columbia and Ontario being the principal provinces of entry. Imports into British Columbia declined sharply after 1957, when the plant of Hooker Chemicals Limited at Vancouver came into operation. Imports of anhydrous caustic soda

(1) Transcript, Vol. 5, p. 815
(2) Same, Vol. 6, p. 860

into British Columbia were 2,000 tons in 1958 compared with 8,000 tons in 1956. In 1964 total imports of anhydrous caustic soda into Canada were 2,200 tons, considerably less than one per cent of the commercial market for caustic soda in all forms.

The spokesman for the plywood manufacturers made the following statement regarding the market in Canada for anhydrous caustic soda.

> "the evidence that has been given by the chemical industry was that they really control and dominate the Canadian market for anhydrous sodium hydroxide, and the only place where they do not dominate and control the market are those few areas in Canada where, because of transportation costs, it is impossible for them to ship as cheaply as apparently American producers can ship.
>
> "The evidence also shows that the only way in which they can overcome this transportation differential is to accept a very substantial increase in the tariff of the order of four times.
>
> "The evidence also shows that the only place where this is going to be of any substantial benefit to them may be in the province of British Columbia where it will result in an increase ... in their market of something of the order of 750 tons per year, which, in my judgment, is a very small proportion of a market upon which to base a large type of tariff increase; ..."(1)

BROMINE

Bromine "is a very dense, corrosive, reddish or dark brown liquid which, even when cold, gives off suffocating red fumes irritating to the eyes. It inflames the skin, turning it yellow, and ignites organic substances such as sawdust ...

"It is used in the manufacture of medicaments (e.g. sedatives), dyes (e.g. eosins, brominated derivatives of indigo) photographic chemicals (silver bromide) lachrymatory products (bromo-acetone), etc."(2)

Bromine is not produced in Canada. Almost all Canadian imports originate in the U.S.A. and are entered under item 208 of the Customs Tariff which provides for free entry under all Tariffs.

Imports of bromine have increased substantially since 1958 and were about 39,000 pounds valued at $15,000 in 1963, the latest year for which data are available.

At the public hearing in September 1960, the spokesman for Dow Chemical of Canada Limited stated that Dow imported small quantities of bromine and that, although others might be importing bromine into

(1) Transcript, Vol. 14, p. 1965-6
(2) Same, Vol. 6, p. 954

Canada, he had no knowledge of them. The bromine imported by Dow was distributed in Canada by Mallinckrodt Chemical.[1]

He also said:

"To date bromine has not been found in sufficient quantities in Canadian brine to make it worthwhile to produce, but this condition could change at any time."[2]

Under questioning by a member of the Board he replied,

"As far as I know it [bromine] is a chemical in a class by itself, and as far as I know there is nothing else that is competing with it."[3]

The spokesman for Mallinckrodt Chemical stated that the uses of the product "are small and scattered and there is not one of them with enough significance to even bother mentioning."[4]

At the public hearing, the spokesman for Dow Chemical said:

"In so far as Dow sales were concerned ... they were not large enough in our opinion to ask for special considerations; ... We are in accord with the Industry Committee's recommendation that bromine goes in the heading rate under halogens at 15 per cent and 20 per cent rates of duty.

"If the Board or other interested parties wish, however, to have bromine listed as an exception at lower rates of duty than the heading rate until 'made in Canada', our company would have no objection."[5]

Imports of Bromine, 1956-63

	U.S.A.		U.K.		Total		
Year	pounds	$	pounds	$	pounds	$	cents per lb.
1956	26,462	10,514	-	-	26,462	10,514	40
1957	18,633	13,045	432	162	19,065	13,207	69
1958	16,957	10,641	440	178	17,397	10,819	62
1959	66,434	24,957	-	-	66,434	24,957	38
1960	70,301	25,757	-	-	70,301	25,757	37
1961	62,007	25,942	-	-	62,007	25,942	42
1962	35,415	13,973	-	-	35,415	13,973	39
1963	39,306	14,613	83	268	39,389	14,881	38

Source: D.B.S., Trade of Canada, Imports, s.c. 8301

(1) Transcript, Vol. 6, p. 958
(2) Same, Vol. 6, p. 956
(3) Same, Vol. 6, p. 957
(4) Same, Vol. 6, p. 958
(5) Same, Vol. 6, p. 955

Under the proposal of the Industry Committee bromine would be placed with other halogens in a tariff item worded in accordance with the Brussels Tariff Nomenclature for heading 28.01, "halogens (fluorine, chlorine, bromine and iodine)." The rates of duty proposed for this item were 15 p.c., B.P. and 20 p.c., M.F.N. This proposal would increase the rates of duty on bromine from free entry under tariff item 208 to the proposed rates of 15 and 20 per cent.

The Canadian Pharmaceutical Manufacturers Association expressed an interest in bromine as one of the less important chemicals used by its members. The Association recommended that until they were made in Canada chemicals which are not made in Canada and are used in the manufacture of pharmaceuticals should be dutiable at rates of Free, B.P. and 15 p.c., M.F.N., unless otherwise provided for; when made in Canada rates of 15 p.c., B.P. and 20 p.c., M.F.N. should apply.(1)

In the five years 1959-63 the value of imports, almost entirely from the U.S.A., averaged $21,102 annually. The imposition of an M.F.N. tariff of 20 p.c. on these imports would probably raise the cost to Canadian consumers. From the evidence it appears that bromine is not competitive with any other chemical.

FLUORINE

Fluorine is a pale yellow gas, which is very corrosive and poisonous and reacts vigorously with most oxidizable substances at room temperature, frequently with ignition. It forms fluorides with almost all elements.

At the public hearing, in September 1960, the spokesman for the Industry Committee said:

> "Fluorine is not, to our knowledge, made in Canada and the value of the imports is negligible, less than $1,000 a year ... no one thought it of sufficient importance to draw it to our attention. Our feeling is that fluorine is not significant enough to warrant separate tariff treatment at this time.
>
> "The principal markets for fluorine in the United States are as a high energy fuel in rocket systems and in the manufacture of uranium hexachloride for use in atomic energy."(2)

When asked if fluorine was competitive with any other chemical, he answered, "...it is in a class by itself".

Fluorine is entered under tariff item 208t as an unenumerated chemical of a kind not produced in Canada, free of duty under the B.P. Tariff and at 15 p.c. under the M.F.N. Tariff. The Industry Committee proposed that fluorine should be classified, along with other halogens in a tariff item worded like heading 28.01 of the B.T.N., dutiable at 15 p.c., B.P. and 20 p.c., M.F.N.

The spokesman for the Committee gave no indication why these rates would be appropriate specifically for fluorine.

(1) Transcript, Vol. 87, p. 13321
(2) Same, Vol. 6, p. 958

IODINE

Iodine is one of the elements of the halogen group which also includes chlorine, bromine and fluorine. It is a very dense, crystalline solid having a greyish black colour and a metallic glint. It volatilizes at ordinary temperatures in air, giving off a rich violet vapour with a characteristic odour.

Iodine occurs widely but is never found free in nature. It is present in sea water, in minerals and in much animal and vegetable matter. It is generally derived by extraction from mother-liquors of natural sodium nitrates. Other processes include extraction from the ashes of seaweed in Japan and from the brine of oil wells in California.

Iodine is used as a reagent and catalyst in chemical processes and to produce photographic chemicals (sodium iodide), dyes (erythrosines), pharmaceuticals, and food additives (calcium iodate). It is available commercially as crude iodine, which is actually about 99 per cent pure, and as refined or sublimed iodine.

About 95 per cent of the impurities are removed in the process of sublimation. In this process the crude product is heated so that it passes from the solid to the gaseous state which is then condensed directly to a purer solid state. The sublimed iodine is packaged and sold in a variety of containers including small bottles and jars, 100-pound cases containing two 50-pound jugs, and 100 and 200-pound kegs.

Crude iodine is not produced in Canada and all supplies are imported. Sublimed iodine is manufactured in Canada by only one company.

Crude Iodine

In the past few years, 1961-64, Canada imported between 151,000 and 244,000 pounds of crude iodine annually, with values ranging from about $170,000 to $270,000. During this period the imported crude iodine had an average value of $1.11 a pound and varied between $1.04 a pound in 1963 and $1.22 a pound in 1964. Crude iodine is used in Canada principally to make iodine compounds and as an additive to feed in animal nutrition. Potassium iodide and calcium iodate are the major iodine compounds manufactured. They are used in a variety of pharmaceutical products, photographic chemicals, and human and animal food additives.

Until 1958, Chile and the U.S.A. were the only suppliers to the Canadian market; imports from the U.S.A. were usually more than 80 per cent of the total. After 1956 the Chilean share rose sharply, and until 1962 was about one-half of the total. In 1958 imports from Japan began to displace those from the U.S.A. and by 1962 they were also displacing imports from Chile. In 1963 imports from Japan were about 80 per cent of the total and in 1964 almost 90 per cent.

The price of sublimed iodine is usually about twice that of crude iodine. From 1960 to 1963 published prices of crude iodine in the U.S.A. were $1.10 a pound compared with $2.20 a pound for the sublimed form. In 1964 the price of crude iodine rose to $1.18 a pound; the price of sublimed iodine remained essentially unchanged.

Imports of Crude Iodine, by Country of Origin, Selected Years, 1955-64

Year	U.S.A.		Chile		Japan		Total	
	'000 lb.	$'000	'000 lb.	$'000	'000 lb.	$'000	'000 lb.	$'000
1955	94	128	18	26	-	-	112	154
1957	43	47	50	53	-	-	93	100
1959	17	16	61	55	34	28	112	100
1960	24	22	45	42	14	12	83	76
1961	17	19	116	129	66	70	244	270
1962	10	12	72	85	68	72	151	169
1963	8	10	42	50	190	189	240	249
1964	16	40	3	3	159	172	179	218

Source: D.B.S., Trade of Canada, Imports, s.c. 8304

Prices of Crude and Resublimed Iodine in the U.S.A., 1956-65

Year	Crude, in Kegs		Resublimed, U.S.P., Drums, f.o.b. Works	
	High	Low	High	Low
	$U.S. per lb.		$U.S. per lb.	
1956	1.45	1.10	2.30	2.30
1957	1.10	1.10	2.30	2.30
1958	1.10	.95	2.30	2.00
1959	.95	.95	2.00	2.00
1960	1.10	.95	2.20	2.00
1961	1.10	1.10	2.20	2.20
1962	1.10	1.10	2.22	2.20
1963	1.18	1.10	2.22	2.20
1964	1.18	1.18	2.22	2.20
1965	1.27	1.18	2.22	2.20

Source: Oil, Paint and Drug Reporter

Sublimed Iodine

The only company that has produced sublimed iodine in Canada in recent years is the Mallinckrodt Chemical Works Limited at Montreal. At the public hearing a representative of the company said:

> "Canadian production and import volume (which can only be estimated according to our best trade knowledge) would both be measurable in pounds rather than in tons per annum.
>
> "Lacking detailed information in imports, we can only estimate that the bulk of Canadian market requirements has for some years been provided from Canadian production...We believe that the bulk of the imports are entering Canada in comparatively small individual orders, as part of the general import

> business of persons such as laboratory supply houses, who order a variety of chemicals at the same time from a single supplier abroad."[1]

The available information suggests that the value of imports of sublimed iodine has not exceeded $5,000 annually in any of the past few years.

Tariff Considerations

The Customs Tariff differentiates between crude iodine and other forms. Crude iodine is named in tariff item 208, which specifies free entry under all Tariffs.

Other forms of iodine are entered as unenumerated products under item 711 at 15 p.c., B.P. and 20 p.c., M.F.N. At the public hearing in September 1960 the Mallinckrodt spokesman stated:

> "We ... believe that practically all ... imports [of sublimed iodine] enter from the United States, with only negligible imports from the United Kingdom."[2]

Thus it appears that the effective rate of duty for refined iodine is 20 p.c.

At the public hearing, the company and the Industry Committee proposed that iodine should be classified with the other halogens in an item worded like heading 28.01 of the Brussels Tariff Nomenclature, "halogens (fluorine, chlorine, bromine and iodine)." The company spokesman urged that crude iodine should continue to be entered free of duty until the product is made in Canada; when made in Canada, rates of 15 p.c., B.P. and 20 p.c., M.F.N., should apply.[3] He also urged that sublimed iodine should continue to be dutiable at 15 p.c., B.P. and 20 p.c., M.F.N.[4] The intent of the rate proposal was to differentiate between crude and refined iodine; the words "sublimed" and "resublimed" were used throughout the hearing to mean "refined".

The company's rate proposals would leave the existing rates unchanged for both crude and sublimed iodine. However, if crude iodine were ruled to be made in Canada the rates of duty would be 15 p.c., B.P. and 20 p.c., M.F.N. in place of the present free entry under all Tariffs.

Naugatuck Chemicals Division of Dominion Rubber expressed an interest in crude iodine as a raw material used by the company.[5] The company did not indicate its position with respect to chemicals which are not produced in Canada.

The Canadian Pharmaceutical Manufacturers Association indicated an interest in sublimed iodine. The Association proposed that

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(1) Transcript, Vol. 6, p. 944-5
(2) Same, Vol. 6, p. 945
(3) Same, Vol. 6, p. 942, 943, 945
(4) Same, Vol. 6, p. 938, 942
(5) Same, Vol. 6, p. 908

chemicals which are used in the manufacture of pharmaceuticals should be dutiable at rates of 15 p.c., B.P. and 20 p.c., M.F.N., when they are ruled to be made in Canada.(1) The spokesman for the Association gave no indication why these rates would be appropriate specifically for sublimed iodine.

In support of continuing free entry for crude iodine Mallinckrodt pointed out that the product was not now produced in Canada, was not expected to be produced in Canada in the forseeable future, and was not competitive with other products manufactured in Canada. The company spokesman said the cost of crude iodine constituted a large proportion of the cost of sublimed iodine. However, he did not indicate why rates of 15 p.c., B.P. and 20 p.c., M.F.N. might be appropriate for crude iodine when it is produced in Canada, nor did he say why the existing rates for sublimed iodine, of 15 p.c., B.P. and 20 p.c., M.F.N. were necessary.

Mallinckrodt Chemical noted that it was the principal Canadian consumer of crude iodine. At the time of the hearing Canadian imports were valued between $75,000 and $100,000 annually. All imports were from M.F.N. countries so that the imposition of an M.F.N. duty of 20 p.c. might result in a substantial increase in cost for an important raw material used by the company.

If B.T.N. heading 28.01 were used as a tariff classification for iodine both the crude iodine of tariff item 208 and the refined iodine of item 711 would be classified under it. It was said, at the hearing, that there would be no difficulty in differentiating between the two forms.

(1) Transcript, Vol. 87, p. 13321

SULPHUR, SUBLIMED OR PRECIPITATED; COLLOIDAL SULPHUR - B.T.N. 28.02

Sublimed, precipitated and colloidal sulphur differ from most other forms of elemental sulphur mainly in their physical forms and properties, but they are also of a slightly higher degree of purity. They are used principally in the manufacture of rubber, pharmaceuticals, fungicides, pesticides, and laboratory reagents.

Sublimed sulphur is also commonly known as "flowers of sulphur"; it should not be confused with finely ground natural sulphur, the "flour" mentioned in tariff item 208. Sublimed sulphur is obtained by slow distillation of crude sulphur. The vapour is condensed and the resulting solid product is made up of very light, fine particles consisting of minute crystals of sulphur. Sublimed sulphur is usually 99.95 per cent pure. It is used in the production of certain types of rubber, insecticides, fungicides and pharmaceuticals.

Precipitated sulphur is usually produced by boiling sulphur and lime in water and precipitating the sulphur contained in the filtered solution with hydrochloric acid. This form is used principally in pharmaceutical products.

Colloidal sulphur may be obtained in a variety of ways. Its main distinguishing characteristic is that the particles are so small that they will remain suspended in water for a limited time. The principal application of colloidal sulphur is in pharmaceutical products.

As far as is known there is little if any Canadian production of these refined forms of sulphur; the Canadian market is, therefore, supplied entirely, or almost entirely, by imports. In 1963, imports valued at $230,000 were reported for "refined" and "insoluble" sulphur. In addition, some refined sulphur (flowers of sulphur) apparently was entered under tariff item 208.

The principal use of the refined forms of sulphur in Canada appears to be in the manufacture of high grade rubber goods. This is the principal application in which insoluble sulphur is used. The spokesman for the Industry Committee estimated that pharmaceutical use accounts for about 20 tons annually, valued between $3,200 and $3,600.(1) An unknown additional amount is used in the manufacture of pesticides.

Tariff Considerations

Refined forms of sulphur are entered under tariff item 208t as unenumerated chemicals of a kind not produced in Canada, with rates of Free, B.P. and 15 p.c., M.F.N. Some refined sulphur, which is treated with oil, is also entered under item 220a(i) as a non-alcoholic mixture at rates of 15 p.c., B.P. and 20 p.c., M.F.N. In addition, some imports of "flowers" of sulphur (sublimed sulphur) are known to have been entered under tariff item 208, which includes "flour" of sulphur, a finely ground form of crude sulphur.

(1) Transcript, Vol. 6, p. 982

As far as is known the imports of refined forms of sulphur are all from the U.S.A. The applicable rates are, therefore, either 15 p.c., M.F.N. under tariff item 208t, or 20 p.c. under item 220a(i).

At the public hearing, the spokesman for the Industry Committee stated:

> "As no duty rate recommendations for this heading were submitted by the industry, the committee tentatively assigned the same rates to this heading as had been proposed for the other grades of sulphur which are classified by heading No. 25.03 [sulphur, other than sublimed, precipitated and colloidal]. (Subsequent inquiries concerning the commercial significance of goods classified by heading 28.02 have not produced any reason for changing the 0 - 0 rates which were tentatively assigned to it.) These rates have therefore been shown in the Committee's proposal for heading 28.02."(1)

The Committee's proposal, therefore, was for free entry of refined sulphur under an item worded like B.T.N. heading 28.02, "Sulphur, sublimed or precipitated; colloidal sulphur."

At other hearings, particularly those dealing with end-use items, the interest of various parties in the refined forms of sulphur was made known to the Board.

The Rubber Association of Canada, whose members appear to be by far the largest users of the products, urged that all forms of sulphur be entered free of duty under all Tariffs.(2) In a letter to the Board dated October 30, 1962, the Association said:

> "since all forms of sulphur used by the rubber industry perform the same function, it is our opinion that all should be classified under a single duty-free tariff item."

A group of seven pesticide manufacturers indicated their interest in refined sulphur and proposed that chemicals used as disinfectants, pesticides or fungicides should be entered free of duty under all Tariffs.(3) Sulphur, if imported for these purposes, is now entered free of duty under tariff item 219a(2) if in packages exceeding three pounds each in gross weight, or free of duty under item 791 as a material for use in the manufacture of pesticides.

The Canadian Federation of Agriculture supported a similar proposal for such chemicals.(4)

Consolidated Mining and Smelting Company of Canada Limited reported an interest in refined sulphur of B.T.N. heading 28.02 and urged that there be no increase in the existing rates of duty.(5)

(1) Transcript, Vol. 6, p. 981
(2) Same, Vol. 165, p. 24368
(3) Same, Vol. 108, p. 16332
(4) Same, Vol. 110, p. 16631
(5) Same, Vol. 5, p. 715

Naugatuck Chemicals Division of Dominion Rubber Limited expressed an interest in refined sulphur but did not indicate its position with respect to chemicals which are not ruled to be made in Canada.

The Canadian Pharmaceutical Manufacturers Association reported that refined sulphur was a chemical of minor economic importance to its members. It urged that chemicals which were not made in Canada and were used in the manufacture of pharmaceuticals should be dutiable at rates of Free, B.P. and 15 p.c., M.F.N. unless otherwise provided for; when they are ruled to be made in Canada the Association supported rates of 15 p.c., B.P. and 20 p.c., M.F.N.(1)

Thus, the proposals before the Board for refined sulphur were mainly for free entry under the B.P. and M.F.N. Tariffs.

The Rubber Association, the Federation of Agriculture and others who supported free entry for the products did so in general submissions to the Board. The principal arguments in support of free entry were that higher rates would increase costs and make Canadian manufacturers less able to compete effectively in the domestic and export markets.

In the Brussels Tariff Nomenclature, if sulphur is treated with oil simply to facilitate handling and shipment, it remains classified under heading 28.02. However, if the treatment with oil conferred special properties to the product and rendered it particularly suitable for some types of use rather than for general use, it would be excluded from heading 28.02 and classified under heading 38.19.

In its letter to the Board the Rubber Association stated, "the oil treatment of insoluble sulphur facilitates the elimination of health and fire hazards involved in handling a finely powdered sulphur of this type." If the addition of the oil did not make the product suitable for use in other applications, it would remain classified in heading 28.02 of the B.T.N.

(1) Transcript, Vol. 87, p. 13321

CARBON, INCLUDING CARBON BLACK, ANTHRACENE BLACK, ACETYLENE BLACK AND LAMP BLACK - B.T.N. 28.03

INTRODUCTION

Carbon is a non-metallic element which is a constituent of all organic compounds. It occurs naturally in such forms as coal, graphite and diamonds or it may be manufactured, usually from organic substances such as natural gas, petroleum or acetylene. Many of the important forms of carbon are classified under heading 28.03 of the Brussels Tariff Nomenclature. The heading excludes several forms of carbon such as natural and artificial graphite (B.T.N. headings 25.04 and 38.01), coal (B.T.N. Chapter 27), wood charcoal (44.02), activated carbon (38.03), animal black (38.02), diamonds (71.02 and 71.04) and certain black mineral colouring matter of heading 32.07.

Of the four carbons named in heading 28.03 carbon black and acetylene black are produced in substantial quantities in Canada; lamp black and anthracene black are not made in Canada. Lamp black is imported only in small quantities; anthracene black has no known commercial importance in Canada.[1] Carbon black is by far the most important of the group, economically.

Carbon Black

Carbon black is one of the most finely divided substances known. It is produced by two principal types of process, "channel" and "furnace", which yield three general types of carbon black, "channel blacks", "furnace blacks" and "thermal blacks". The last-named are produced by the furnace process. Each type is available commercially in a number of grades and each type and grade is preferred for particular applications. The principal uses of carbon blacks are in the production of rubber; channel blacks are generally preferred for natural rubber and furnace blacks for synthetic rubber. The most important types of commercial carbon blacks are made by the furnace process. This is the only process used in Canada.

Prior to 1953, all Canadian requirements of carbon black were imported. In that year Cabot Carbon of Canada Limited established a plant at Sarnia, Ontario, which was reported to have an annual capacity of 80 million pounds. In 1962, Columbian Carbon Canada Limited established a plant at Hamilton, Ontario, with an annual capacity of about 50 million pounds. These plants were designed to produce a number of different grades. However, both plants produce only furnace blacks and do not produce some of the grades of furnace blacks which are used in Canada. In mid-1965 it was reported that Cabot Carbon was increasing its capacity from 100 million to 118 million pounds annually; in September 1965, Columbian Carbon announced an expansion of capacity to 90 million pounds a year.

As noted earlier, the principal use of carbon black is in the manufacture of rubber products; the manufacture of automobile tires

(1) Transcript, Vol. 7, p. 1019

accounts for a large part of the use by the industry. Carbon black is also used in Canada for the manufacture of inks, linoleum, paints, wire and cable coatings, plastics and miscellaneous chemicals. In its less important applications carbon black is used mainly as a colouring agent. In 1962 and 1963 its use by the rubber industry was 97 per cent of the total known consumption of carbon black in Canada.

Consumption of Carbon Black, by Industry, 1962 and 1963

Industry	1962 '000 lb.	1962 $'000	1963 '000 lb.	1963 $'000
Rubber Products	87,718	7,007	99,082	8,290
Inks	1,931	256	1,978	231
Paints	386	133	481	167
Misc. Chemicals	231	41	334	40
Others	66	16	74	15
Total Accounted	90,333	7,453	101,949	8,743

Source: D.B.S., various publications and trade magazines

Until 1953 all Canadian supplies were imported and were about 57 million pounds annually valued at $3.7 million. With the beginning of Canadian production, imports declined; in the three years, 1954-56 they averaged around 42 million pounds with a value of approximately $2.7 million, annually. Imports continued to decline, in spite of increased domestic use of the product, and in the five years, 1960-64, averaged 25 million pounds with a value of about $2 million.

Trade reports indicate that Canadian use in 1964 exceeded 100 million pounds of carbon black.(1) In that year imports were 24 million pounds valued at $2.1 million. Relative to reported consumption, imports were therefore about 20 per cent of the total domestic supply. The submission of the Rubber Association of Canada,(2) and other information suggests that a large part of the imports were of grades and types which are not available from Canadian production. Imports are almost entirely from the U.S.A.

In the U.S.A., the carbon black industry is located almost entirely in the southwest, mainly in the states of Texas and Louisiana. Trade sources reported that there were 30 carbon black plants in operation in 1964 with a total capacity of 2,313 million pounds of furnace black, 245,000 pounds of thermal black and 201,000 pounds of charcoal black, an average of about 90 million pounds per plant.

(1) Canadian Chemical Processing, April 1965, p. 53
(2) Transcript, Vol. 6, p. 999

Imports of Carbon Black, Selected Years, 1952-64

	million lb.	$'000	$ per lb.
1952	58.1	3,708	.06
1955	46.7	3,041	.07
1957	40.2	2,613	.07
1959	39.4	2,691	.07
1961	20.5	1,682	.08
1962	26.6	2,108	.08
1963	27.0	2,141	.08
1964	23.9	2,075	.09

Source: D.B.S., Trade of Canada, Imports, s.c. 8182

Of the 30 U.S. plants, 23 produced furnace black and, of these, ten had capacities for 100 million pounds or more. One of the ten had a capacity exceeding 200 million pounds; six of the ten varied from 100 to 120 million pounds. Of the thirteen smaller plants, with capacities of less than 100 million pounds annually, four were designed to produce between 75 and 90 million pounds per year and nine were designed for outputs of 50 to 70 million pounds annually. The two Canadian plants with capacities of 90 and 118 million pounds after their expansions, would be comparable in size with all but the very largest plants in the U.S.A.

Because of their locations, potentially competitive plants in the U.S.A. are at a considerable freight disadvantage in relation to the Canadian plants in supplying the Canadian market, most of which is concentrated in southwestern Ontario. This was noted by the spokesman for Cabot Carbon when he said:

> "The distance from the present points of manufacture in the Southwestern United States to the market in Canada is great. Consequently, the landed cost of the United States carbon black in Canada contains a fairly large element of freight. While costs of manufacture in Canada have been higher than those experienced in the United States, these have been offset by freight differentials."(1)

In August 1963, the freight advantage of the Canadian plants, relative to producers in the U.S.A., in delivering to consumers in southwestern Ontario, was of the order of 1.2 to 1.7 cents a pound; this advantage amounts to 15 to 21 per cent of the average value of imports in that year.

Both in the U.S.A. and in Canada, carbon black is priced f.o.b. plant, with freight equalized on the most favourably located producer who manufactures an equivalent type and grade of carbon black. Early in 1965, prices of Canadian-produced carbon blacks varied from approximately six to nearly twelve cents a pound, the most widely sold

(1) Transcript, Vol. 6, p. 988

grades being from seven to nine cents a pound. Some grades which are not available from Canadian production are considerably higher priced than the carbon blacks which are produced in Canada. Prices in Canada and the U.S.A. of two representative grades of furnace blacks are given below; these would account for a substantial part of Canadian use.

Representative Prices of Carbon Black, Furnace Type, in Bulk, Carload Lots, f.o.b. Works, Canada and the U.S.A., 1960-65

	High Abrasion		Fast Extruding	
	Canada	U.S.A.	Canada	U.S.A.
	- cents per pound in Canadian currency -			
1960	8.25	7.03	7.25	6.06
1961	8.25	7.35	7.25	6.33
1962	8.25	7.48	7.25	6.41-6.68
1963	8.25	7.55	7.75	6.47-6.74
1964	8.25	7.55	7.75	6.74
1965	8.75	7.58	7.25	6.77

Source: Canadian Chemical Processing and Oil, Paint and Drug Reporter

Acetylene Black

Acetylene black is derived from the incomplete combustion or thermal decomposition of acetylene gas. It has unique properties which have led to its use in dry batteries. It is also used in plastics, rubber and other materials to impart electrical conductivity to them.

Shawinigan Chemicals Limited, Shawinigan, Quebec, was the sole North American producer of acetylene black until May 1964, when Union Carbide Corporation came into production at Ashtabula, Ohio. At the public hearing in 1960, the spokesman for Shawinigan Chemicals informed the Board that about 97 per cent of the company's output was exported, mainly to the U.S.A. and Britain.(1)

U.S. data show imports of acetylene black into the U.S.A. from Canada to have been about seven to eight million pounds annually, 1957-62, with an annual value of about $1.3 million. British statistics do not show acetylene black separately. The available information suggests that, in total, Canadian exports and domestic use probably exceeded 12 million pounds valued at more than $2 million.

The principal use of acetylene black is in the manufacture of dry storage batteries such as are used for flashlights, transistor radios and similar purposes. Union Carbide, the company which established a plant in the U.S.A., is one of the major producers of these types of batteries in the U.S.A. The announced capacity of the U.S. plant was eight million pounds per year, approximately the quantity imported annually in recent years, almost all of which was supplied by Shawinigan Chemicals.

(1) Transcript, Vol. 6, p. 1011

Imports of Acetylene Black into the U.S.A. from Canada 1957-63

	'000 lb.	U.S. $'000	Unit Value ¢ U.S. per lb.
1957	7,561	1,341	17.7
1958	7,154	1,287	18.0
1959	7,207	1,331	18.5
1960	6,785	1,303	19.2
1961	8,074	1,482	18.4
1962	7,435	1,322	17.8
1963 Jan.-Aug.[a]	3,436	589	17.1

(a) Not available after August 1963

Source: U.S. Imports for Consumption, FT-110, s.c. 8380100

Lamp Black and Anthracene Black

Lamp black is a black or grey pigment, produced by the incomplete burning of low-grade heavy oils in a closed system. Although its properties are different from those of carbon black, the latter was said to be replacing it in its chief use, as a pigment, in the Canadian market. Lamp black is not made in Canada. Imports have been small, amounting in 1963 to 203,000 pounds, valued at $38,000. Since 1960, imports have been entirely from the U.S.A.

Anthracene black is produced by the incomplete combustion of anthracene gases. It also is not produced in Canada, nor is it known to have any commercial importance in this country.

No representations were made relating specifically to lamp black or anthracene black.

TARIFF CONSIDERATIONS

Lamp black and carbon black are enumerated in tariff item 239 of the Customs Tariff, "lamp black, carbon black, ivory black and bone black"; the item provides for free entry under all Tariffs. Acetylene black and anthracene black are not specifically provided for in the Customs Tariff, but it is understood that they would also be admitted under item 239.

Carbon Black

At the public hearing in September 1960, Cabot Carbon, at that time the only Canadian producer of carbon black, and the Rubber Association of Canada, representing the major consumers of carbon black, urged that the existing duty-free status of the product be continued.[1]

(1) Transcript, Vol. 6, p. 989, 1001

Polymer Corporation expressed its interest in the continued duty-free entry of carbon black, which it now imports under tariff item 851, as a material for use in the manufacture of synthetic rubber.(1)

The proposal of Cabot Carbon was made conditional on conditions which existed at the time of the hearing remaining unchanged. In this connection its spokesman referred to its freight advantages over producers in the U.S.A., duty-free entry for residual oils, the principal raw material, and the continued existence of a Canadian market sufficiently large to afford the level of production at that time.

The Rubber Association of Canada pointed to the import of grades which are not produced in Canada and to the effect on the competitive position of Canadian rubber manufacturers of any increase in cost resulting from the imposition of a duty on carbon black, an essential raw material.

As was noted earlier, the plant of Cabot Carbon although smaller than some in the U.S.A., was comparable in size with most of the larger plants in the U.S.A. At Sarnia, the company is relatively close to the major consuming points in Canada. In 1963 the freight advantage of the plant relative to producers in the U.S.A. was equivalent to about 15 per cent of the average value of imports at that time. It is probable that Columbian Carbon, the company which began production at Hamilton in 1962, may be a more serious competitor in the Canadian market than foreign producers.

Acetylene Black

Shawinigan Chemicals Limited did not make a specific proposal regarding rates, leaving this matter to the judgment of the Tariff Board. Its spokesman said:

> "At the present time, we do not need a duty on this material against the normal competition of the major trading nations since many of them do not produce this special material or their quality is inferior. Our main concern is the possibility of unfair competition from Iron Curtain state trading countries."(2)

He also suggested that the Board might consider whether a special exception to a proposed item worded like B.T.N. heading 28.03 should be provided for acetylene black at low or free rates, or whether it should be allowed to become dutiable at rates of 15 p.c., B.P. and 20 p.c., M.F.N.

At the time of the hearing Shawinigan Chemicals was the only producer of acetylene black in North America, with about 97 per cent of its market being in the U.S.A. and the U.K. There have been no known imports of acetylene black into Canada. In 1964, a second North American plant was established in the U.S.A.

(1) Transcript, Vol. 5, p. 769
(2) Same, Vol. 6, p. 1006

Lamp Black and Anthracene Black

As noted earlier, no representations were made to the Board specifically with respect to either lamp black or anthracene black. However, in a general recommendation, the Industry Committee proposed that products for which no other recommendations were made to the Board should be dutiable at rates of 15 p.c., B.P. and 20 p.c., M.F.N.[1] The spokesman for the Committee did not indicate why these rates would be appropriate specifically for either lamp black or anthracene black, but they were the rates generally proposed by the Committee as a residual provision for chemicals.

Other Products of Tariff Item 239

Tariff item 239 makes specific provision for ivory black and bone black; in the Brussels Tariff Nomenclature these are classified in heading 38.02. If a tariff item worded like heading 28.03 of the B.T.N. were introduced into the Customs Tariff other provisions would have to be made for the ivory black and bone black of tariff item 239, which are excluded from heading 28.03. The proposal of the Industry Committee was that these products be classified in an item worded like B.T.N. heading 38.02. The subject is dealt with in the part of the report on that heading.

(1) Transcript, Vol. 3, p. 416

HYDROGEN, RARE GASES AND OTHER NON-METALS - B.T.N. 28.04; CARBON DIOXIDE, CARBON MONOXIDE AND NITROUS OXIDE - B.T.N. 28.13

INTRODUCTION

In Canada, six inorganic gases of significant economic importance are produced for sale by the compressed gas industry. In order of commercial importance these are oxygen, carbon dioxide, argon, nitrogen, nitrous oxide and hydrogen. Oxygen, argon, nitrogen and hydrogen are classified in heading 28.04 of the B.T.N.; carbon dioxide and nitrous oxide are classified in heading 28.13. Heading 28.04 also provides for helium, krypton, neon and xenon gases which have been of little commercial importance in Canada, although helium is attaining commercial significance following the development of deposits in Saskatchewan.

The discussion which follows deals with the gases of headings 28.04 and 28.13, enumerated above. (Liquid air and compressed air are dealt with under B.T.N. heading 28.53.) The other non-metals of heading 28.04, phosphorus, selenium, tellurium, arsenic, silicon and boron, follow the gases.

Many features relating to the production and distribution of the various inorganic, industrial gases are very similar. As a result, and to avoid considerable repetition, the part of the discussion which deals with the tariff considerations relates to all of the gases which are otherwise discussed individually.

HYDROGEN, RARE GASES AND OXYGEN - 28.04; CARBON DIOXIDE, CARBON MONOXIDE AND NITROUS OXIDE - 28.13

Air is the raw material from which a number of the inorganic gases are produced by the process of liquid fractionation. These include oxygen, nitrogen, argon, krypton, neon and xenon. Because the gases are produced by the same process, companies often manufacture more than one of them at the same location. In Canada, carbon monoxide and carbon dioxide are produced mainly from fuel oil or natural gas, although large amounts of carbon dioxide are also obtained as a by-product of the manufacture of ammonia, urea and other chemicals. Coal or coke are the principal raw materials for the production of hydrogen with large quantities also being available as a by-product of chlorine-caustic soda output.

Until fairly recently most gases were shipped under high pressure in special containers such as steel cylinders. The cost of transporting gases in these containers, the weight of which greatly exceeded that of the contents, led to the establishment of relatively small plants near consuming centres. In recent years technological developments have made possible the relatively cheap transport of gases in liquefied form. This has given rise to the establishment of large plants which produce and ship the products as liquids. Tank cars or tank trucks are used to transport the product to branch plants or to large users. Here the liquid is converted to the gaseous state for use or for local distribution, usually in cylinders, from branch plants to consumers.

At the present time there are three general types of plants in operation in Canada. The first is the relatively large plant which can produce and distribute the liquid as well as the gaseous form. The second type consists of smaller plants which produce gases but which lack the additional equipment needed to liquefy them; these establishments ship the products in cylinders in the gaseous state. The third type consists of plants which are relatively small and which do not manufacture gases; these plants receive liquefied gases and convert them into the gaseous form for local distribution.

A fourth type of plant occurs in connection with oxygen, the "on-site" plant. Such plants may be owned and operated by a compressed gas manufacturer, but are built on the site of the user, often a steel producer, to supply the large quantities of oxygen which are used in some metallurgical processes.

Neon, krypton and xenon are not produced in Canada; helium has been produced in Canada only since 1963. The principal gases of headings 28.04 and 28.13 produced in Canada are oxygen, nitrogen, argon, carbon dioxide, nitrous oxide and hydrogen.

It is estimated that, exclusive of on-site oxygen, shipments of the Canadian-produced gases were valued at nearly $22 million in 1962. Shipments of oxygen accounted for about 60 per cent of the total; carbon dioxide, argon and nitrogen, together, were about one third of the total, with hydrogen and nitrous oxide accounting for the remaining, approximately seven per cent. If the value of on-site oxygen were added, oxygen would be a much larger share of the larger total value.

In 1962, there were five companies which produced and distributed various gases on a national basis. These were: Union Carbide Canada Limited (Linde Gases Division), Canadian Liquid Air Company Limited, Canadian Oxygen Limited, Liquid Carbonic Canadian Corporation, Ohio Chemical Canada Limited. Nine other companies produced one or more of these gases mainly for captive use, or recovered gas (for example hydrogen) as a by-product of their other operations; most sold part of their output. In 1962, the compressed gases enumerated earlier were being produced in 51 plants, 37 of which were operated by the three largest national distributors. These larger distributors generally produced and sold a number of the gases; the others sold only one or two. Two of the large companies were subsidiaries of U.S. companies and one was Belgian-owned.

OXYGEN

The Product and The Industry

Oxygen constitutes about one fifth of the volume of air and is a colourless, odourless and tasteless gas, liquefiable at about -300°F. It can be derived by the fractionation of air or by the electrolysis of water. In Canada, it is produced mainly by fractionation of liquid air.

In 1962, oxygen was produced by 43 plants, one or more in every province except Prince Edward Island. Eleven of these were large plants, capable of liquefying the gases which they produced; 21 had much smaller capacities and produced only the gaseous form for sale, and 11 were "on-site" or "tonnage" plants whose output was largely or entirely for the use of the company on whose site they were located. About 26 additional plants were essentially packagers or distributors of the oxygen which they received in liquid form from producers.

Statistics on total production of oxygen in Canada are not available. However, it is estimated that the capacity of on-site plants in 1962 exceeded 700,000 tons and that other shipments of oxygen in 1962 amounted to about 89,000 tons. Thus, in 1962, Canadian annual capacity was of the order of 800,000 tons of oxygen, of which about 90 per cent was in on-site plants whose output was essentially captive to the user at each particular site.

The on-site plants ranged in capacity from about 12 to 700 tons of oxygen per day.(1) Most ranged between 150 and 350 tons per day, making them, on average, among the largest plants of their kind in operation. The proportion that on-site sales are of the total is increasing, reflecting mainly the increasing use of oxygen in steel production.

The Market

Sales of oxygen in 1962, exclusive of on-site sales, are estimated to have had a value of about $12 million, almost two thirds greater than in 1953, ten years previously. Sales of on-site oxygen would add considerably to the value of sales although far less than in proportion to its volume. However, there are no figures available regarding this very important part of the industry. Because sales from on-site plants are generally based on long term contracts and special circumstances are involved, they are not sensitive to competition, and prices are not comparable with those for sales to other users.

The principal use of oxygen in Canada is by steel mills, the major users of on-site oxygen. It is estimated that about 530,000 tons per year, or about 1,500 tons per day, are used for this purpose. Approximately 180,000 tons per year, or nearly 500 tons per day, are used in the manufacture of ammonia, in the oxidation of liquid petroleum gases, and in the production of chemicals such as formaldehyde, methanol and acetaldehyde. About 10 per cent of the consumption is in welding and other applications, by the construction industry, machine shops and others, and a substantial volume of oxygen is used by hospitals and in aircraft.

There are practically no data available regarding imports or exports of oxygen. The little information that is available indicates that foreign trade is negligible relative either to domestic sales or use.

(1) Transcript, Vol. 7, p. 1065

As noted earlier, oxygen is shipped in gaseous form under high pressure in steel cylinders. Under the usual pressure of about 2,200 pounds per square inch (p.s.i.) a cylinder holds about 150 times as much oxygen as it would under atmospheric pressure. However the cylinders, which must be specially built to withstand such high pressures, constitute about 80 to 90 per cent of the gross weight, thus making transportation in cylinders costly. The need to return the expensive empty cylinder adds further to the cost of transportation.

The development of methods of shipping oxygen in bulk, as a liquid, has made the transportation of oxygen much less costly. In the liquid state oxygen occupies only about one sixth of the volume that it would in the gaseous state, in cylinders. Moreover, while the largest cylinder in common use holds only 24 pounds of gas, tank cars for transportation of liquid oxygen may contain 80,000 pounds or more, thus reducing the ratio of dead weight to gas. Both railway and truck transportation are available for bulk liquid oxygen.

In recent years, the manufacturers have developed "cold converters" which convert liquid to gas, automatically, at consumers' plants. These are serviced regularly by the manufacturer. This system of distribution has made the use of liquid oxygen practical, especially for larger users. It has also encouraged the establishment of local distributing plants at locations where, in the past, small gas-producing plants would have been built. These local plants receive liquid oxygen and convert it to gas for sale to users who purchase oxygen in small quantities, in cylinders. The development of cold converters in conjunction with the economy of shipping liquid oxygen has led to the development of larger liquefying plants and the gradual conversion of smaller gas-producing plants into packaging and distributing branches.

From the foregoing it is apparent that the major element in competition is the relative cost of shipping liquid oxygen in bulk to large consuming centres, and the cost of establishing and maintaining conversion and distribution facilities.

An examination of costs of freight from Canadian and United States producers indicates that Canadian manufacturers have a freight advantage to most major consuming locations in Canada. For the approximately 90 per cent of the Canadian consumption which is supplied by on-site output, Canadian manufacturers have a captive market. For most of the remaining 10 per cent, which in 1962 represented about $12 million in sales, the Canadian plants are more favourably located, though at some centres their advantage is small.

<u>Pricing Policy and Prices</u>

Generally oxygen is sold on a delivered basis and prices reflect transportation costs and volume of sales. At the public hearing, in September 1960, the spokesman for Linde Gases Division of Union Carbide said:

> "It is very complex and very difficult to talk about the prices unless you use a specific case...the pricing structure

of atmospheric gases is very complex and volumes and distances from producing plants affect the selling price in every case."(1)

Although prices of oxygen are not published regularly either in Canada or the United States, one report indicated that in the U.S.A. the price of oxygen in cylinders, on contract basis, remained stable from 1950 to 1956 at 75 cents per 100 cubic feet,(2) while a more recent publication cites a price of $1.30 per 100 cubic feet, f.o.b. plant, to consumers of 15,000 cubic feet monthly.(3) The average value of shipments from Canadian plants varied from $0.67 to $0.88 per 100 cubic feet between 1958 and 1960. Sales of on-site oxygen, which account for the bulk of total sales are on long-term contract. They are not included in these calculations and would be much lower in price because of the volume involved and the economy of pumping the product a very short distance to the consuming plant via a pipeline.

NITROGEN

The Product and The Industry

Nitrogen, which constitutes about four fifths of the volume of the atmosphere, is a colourless, odourless, tasteless gas, which does not support combustion or respiration. At very low temperatures and under pressure nitrogen forms a colourless liquid which boils at -320.3°F.

Nitrogen is produced by the fractional distillation of liquid air in the same process as oxygen and other atmospheric gases. However, oxygen is by far the most important, commercially, of the atmospheric gases and not all processors who produce oxygen recover nitrogen. As in the case of oxygen, equipment for liquefying nitrogen is available only in very large plants. In 1962, nitrogen was produced in 31 plants, 28 of which were owned and operated by the three major compressed gas companies. Three other companies, each of which operated one plant, also produced some nitrogen for sale.

Most nitrogen produced in Canada is for captive use in the production of ammonia; a large part of the output of ammonia is, in turn, used to produce nitrogenous fertilizers. In the crop year of 1963-64 fertilizers sold in Canada and exported contained the equivalent of nearly 360,000 tons of nitrogen.

The Market

The commercial market for nitrogen arises mainly from its use to provide an inert atmosphere in industrial processes. Nitrogen is also used as a refrigerant, an application which is growing rapidly. Its use in frozen food processing and refrigerated transportation is

(1) Transcript, Vol. 7, p. 1095
(2) Industrial Chemicals, Second Edition, p. 561
(3) Chemical and Engineering News, Oct. 28, 1963

expected to provide a growing market for the product. In 1961, shipments of nitrogen by Canadian producers were valued at approximately $1.4 million; it is probable that the value of sales in 1964 did not exceed $2.5 million.

The value of sales in 1961, of $1.4 million, pertained to about 6,000 tons of nitrogen. In contrast sales of fertilizers contained the equivalent of around 320,000 tons of nitrogen and the captive use of nitrogen in other applications also represented large quantities of nitrogen. Thus, although the commercial market for nitrogen has been growing in recent years, it still accounts for only a very small percentage of total output.

As with some of the other industrial gases, the development of methods of transporting the product in bulk, in the liquid state, has made long distance haulage economic; thus the cost of transportation has become a factor of less importance. However, this form of bulk transportation requires the establishment of facilities for converting liquid nitrogen to the gaseous form.

The limited size of the commercial market in conjunction with the need to provide conversion units in order to ship the gas in liquid form have tended to limit foreign trade to negligible proportions; the Canadian market is almost entirely supplied by Canadian manufacturers.

ARGON

Argon is an inert gas which occurs to the extent of about 0.94 per cent of the atmosphere. Like other atmospheric gases, it is produced commercially by fractionation of liquid air.

At the public hearing the spokesman for Linde Gases Division of Union Carbide said:

> "the most unfriendly of these [atmospheric] gases is argon, and because it shuns the company of other elements, argon is useful as a shield to protect materials from impurities. Argon gas is used to keep the tiny filaments in electric light bulbs from burning out. It is also used as a protective shield over certain types of metals while they are being welded."(1)

It is also used widely in the electronics industries and in metallurgical processes which are applied to titanium, aluminum and stainless steel.

Argon is produced for sale by Canadian Liquid Air Company Limited, Linde Gases Division of Union Carbide Canada Limited and Canadian Oxygen Limited. Unlike nitrogen, argon is produced entirely, or almost entirely, for sale. Sales of argon by Canadian producers appear to exceed somewhat those of nitrogen, suggesting sales, in 1964, of the order of $3 million.

(1) Transcript, Vol. 7, p. 1069

Imports of argon have increased in recent years. In 1963 they were valued at $195,000, treble the value of imports in 1959, five years previously. In 1963, imports are estimated to have been less than ten per cent of probable total sales of argon. Exports appear to be very intermittent and of negligible economic importance.

HYDROGEN

In Canada, most hydrogen is manufactured for use in the production of ammonia. Some is a by-product of chlorine-caustic soda output and some is produced by the electrolysis of water. However, most of the hydrogen produced in Canada is from natural gas or other hydrocarbons.

Only a very small part of the hydrogen which is produced in Canada is sold. Most of the product which enters commerce is sold by plants of the compressed gas industry; a very small part of the by-product hydrogen from chlorine-caustic and other chemical plants is also sold.

In 1962, the latest year for which data are available, sales by Canadian producers were valued at approximately $575,000. The available information indicates that imports are occasional and of negligible importance. There is no record of exports.

By far the largest use of hydrogen is in the production of ammonia mainly for use in the manufacture of fertilizers and chemicals. However, because most of this hydrogen is produced captively, these uses have little impact on the commercial market. Hydrogen is sold principally for hydrogenating oils, for "cracking" petroleum products, for cutting and welding metals and for a variety of chemical processes.

Hydrogen is distributed mainly in heavy steel cylinders. As for other inorganic gases, the cylinder weighs much more than the gas which it contains, and costs of transportation are an important part of the delivered cost. This tends to limit the competition to plants which are relatively close to each other and is an important factor in making foreign trade in the product virtually non-existent.

HELIUM

Helium, like argon and nitrogen, is an inert gas. It is the lightest of the gases and can be reduced to lower temperatures than any other substance. Helium occurs in some natural gas but is very rare. It is used in missiles, atomic reactors and for welding aluminum and other metals.

Until 1963 the U.S.A. was the only known non-communist source of the gas, and the discovery of helium in Saskatchewan was the first new source in 20 years. In the fall of 1963, the low temperature gas separation plant of Canadian Helium Limited came into operation near Swift Current, Saskatchewan, with an indicated capacity of 12 million cubic feet per year.(1) Canadian Helium Limited is jointly

(1) Chemistry in Canada, July 1963, p. 7

owned by British American Oil Company, L'Air Liquide Canada Ltée. and British Oxygen (Canada) Limited.(1)

Until this plant began operations, the size of the market for helium in Canada was indicated by the value of imports which was $160,000 in each of the years 1962 and 1963.

The Canadian demand for helium is not large enough to absorb the production of the plant and the company announced that about 75 per cent of its output will be exported. Thus, Canada is likely to become a major supplier of helium. Some helium was exported in 1963.

KRYPTON, NEON, XENON

Krypton, neon and xenon occur in minute quantities in the atmosphere and are separated by the fractionation of liquid air. They are notable for their ability to emit coloured rays under electrical excitation and for their lack of chemical affinity. Their best known application is in displays such as neon signs. None of these three gases is manufactured in Canada. At the public hearing, an industry spokesman said that they are not likely to be produced in Canada in the foreseeable future.(2) Only small amounts of these gases are used in Canada.

CARBON DIOXIDE

The Product and The Industry

Carbon dioxide, the gas second in commercial importance of the group here considered, is also known as carbonic acid, carbonic acid gas and carbonic anhydride. It is a colourless gas at normal temperatures and pressures, a heavy, volatile colourless liquid at -37°C, and a white snow-like solid, usually known as dry ice (or carbon dioxide snow) at -79°C (-110°F). The solid weighs 94 to 97.5 pounds per cubic foot.(3) Carbon dioxide is produced whenever an organic compound is burned in air; it is also a product of the fermentation of carbohydrates and of various chemical processes.

As a commercial product, carbon dioxide is supplied in three forms: as a bulk liquid under relatively low pressure; in a form partly liquid and partly gas in high pressure cylinders, and in solid form in blocks or slabs of compressed dry ice.

In Canada, until 1962, all of the carbon dioxide sold was produced by burning bunker-C fuel oil or natural gas and collecting and purifying the carbon dioxide released.(4) However, at a recent major installation at Maitland, Ontario, the impure carbon dioxide, which constitutes the raw material, is a by-product of a nearby ammonia plant. Several other producers of ammonia use their by-product carbon dioxide, captively, in the production of urea or in other chemical processes.

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(1) British Oxygen (Canada) Limited is now named Canadian Oxygen Ltd.
(2) Transcript, Vol 7, p. 1091
(3) The Condensed Chemical Dictionary, Fifth Edition. Reinhold Publishing Corporation, New York, 1956, p. 223, 414
(4) The process is described in the Transcript, Vol. 10, p. 1406-8

The principal material costs in the manufacture of carbon dioxide are the oil or gas that is burned and the monoethanolamine which is used in the absorber towers to collect the carbon dioxide; these materials are available from Canadian production. The manufacturing, storage and distribution equipment is generally subject to an M.F.N. duty of 20 to 22½ per cent. At the time of the hearing much of the equipment was said to be higher priced in Canada because of this tariff protection.

There is only one company producing carbon dioxide for sale in Canada, Liquid Carbonic Canadian Corporation Limited, whose head office is in Montreal. In 1962 this company produced carbon dioxide in six plants located at:

Dartmouth, N.S.	Toronto, Ont.
Quebec City, Que.	Winnipeg, Man.
Maitland, Ont.	Vancouver, B.C.

The Maitland plant came into operation in 1962 and resulted in the cessation of the company's manufacturing in Montreal. The company also distributed carbon dioxide from a number of warehousing centres.

Because large quantities of carbon dioxide occur in impure form as a result of burning common fuels or as a waste product of many organic reactions, its recovery depends principally on whether there is a sufficiently large application to justify the processing required for its recovery and purification. The establishment of urea production in Canada, in 1959, provided such an application and since 1959 carbon dioxide has been produced captively on a large scale for the production of urea. At the end of 1962 Canadian capacity for producing urea was probably of the order of 145,000 tons. Such an output would require more than 100,000 tons of carbon dioxide, about four times as much as enters commercial channels. Such captive production does not form part of the following analysis.

The Market

As noted earlier, carbon dioxide is used and sold in three forms, gas, liquid and solid (dry ice). The gas and the liquid are used in the same applications, the liquid being converted into the gaseous form at the consuming site. The gas and liquid are used principally for the carbonation of soft drinks; the solid form is used mainly for refrigeration. The spokesman for Liquid Carbonic informed the Board that about 75 per cent of the consumption of the gas was by the carbonated beverage industry. This would indicate a market in 1962 for about 14,000 tons of carbon dioxide valued at around $2 million. The company spokesman also said that sales of dry ice were approximately as large as those of the gas, suggesting a total market for all forms of carbon dioxide of approximately 28,000 tons with a value of the order of $4 million. This market is concentrated in the more densely populated parts of Ontario and Quebec, reflecting the distribution of population in Canada and therefore the demand generated by sales of carbonated beverages, and the concentration of industrial users.

The use of carbon dioxide, in all forms, by the carbonated beverages industry (including malt liquors) has expanded from 13.8 million pounds in 1953 to 22.2 million pounds in 1962, an increase of 60 per cent. Data are not available regarding quantities used for other purposes but Liquid Carbonic's representative estimated that the use of the gas by the chemical industry accounted for approximately 10 per cent of the total, and said that industrial uses generally were slowly gaining in importance relative to use by the beverage industry.

Consumption of Carbon Dioxide by the Soft Drinks and Brewing Industries, Selected Years, 1953-62

	Gas and Liquid		Total Gas	Solid (Dry Ice) Used in Soft
	In Soft Drinks	In Malt Liquors	and Liquid	Drink Industry
		- million pounds -		
1953	11.8	1.0	12.9	0.9
1955	13.2	0.5	13.8	1.3
1957	14.3	0.5	14.8	1.1
1959	17.7	0.5	18.2	0.7
1960	17.9	0.6	18.5	0.5
1961	19.1	0.7	19.8	0.6
1962	20.9	0.3	21.2	1.0

Source: D.B.S., Publication No. 32-208, The Carbonated Beverages Industry and Publication No. 32-205, The Brewing Industry

Carbon dioxide is also used in food processing for fast chilling of meats and other foods and for fast cooling of insulated trucks, railway cars and chill rooms. A relatively new use is in controlled-atmosphere storages to extend the length of time that apples can be stored without serious deterioration. A more recent development is its use to anaesthetize animals before slaughter. Carbon dioxide is used in the paint industry as an inert gas to prevent the danger of fire and explosion; in the rubber industry for rubber tumbling and the manufacture of sponge rubber; and in a variety of other applications such as fire extinguishers, the production of foundry cores, and in greenhouses to stimulate growth of plants.

Carbon dioxide, as dry ice, is convenient for use as a refrigerant and for filling fire extinguishers. In this form carbon dioxide can be stored for short periods of time and can be shipped over short distances without using special containers such as cylinders. Fifty-pound blocks are shipped in insulated containers to minimize the loss through sublimation. This loss is estimated to be about one per cent of the weight per hour, thus limiting the use of this method of handling the product to relatively short times and distances. Because dry ice has a temperature of -110°F, there is no practical method of refrigerating it to prevent this loss, but shipment over short distances is feasible, followed by use of the dry ice soon after arrival, or conversion of it to the gaseous form for later use. Conversion to the gaseous form is by means of a converter, a device into which the dry

ice is placed and in which it passes into the gaseous state and is accumulated.

Until 1946, the shipping range was limited to those areas and uses which either could take advantage of the solid form of the product or could bear the cost of transporting small quantities in cylinders. The tare weight of the cylinder for 20 pounds of gas is 70 pounds, and for 50 pounds of gas it is 110 pounds. Thus, to transport 20 pounds of gas, freight has to be paid on 140 pounds of cylinder (allowing for its return to the supplier).

The ability to transport carbon dioxide in bulk in liquid form, in tank cars, or tank trucks, and to store the product in bulk liquid tanks at the consumer's site caused a considerable change in the marketing situation. Whereas previously it was customary to build plants as close as possible to each major consuming location to avoid high transportation costs, it now became economic to build large liquefying plants to serve much larger market areas. It also permitted the saving of considerable cost associated with handling and filling cylinders and in servicing, testing, repairing and replacing them. Transportation in bulk together with low pressure bulk storage, developed rapidly in the 1950's, and extended the scope of distribution, by tank car and tank truck, to about 300 miles. According to the Canadian producer this enabled suppliers in the U.S.A. to compete in the major marketing areas along the St. Lawrence River, in southern Ontario and in southern British Columbia. In Canada, this method of storing and transporting carbon dioxide was said to have been influential in the decision by Liquid Carbonic to establish the plant at Maitland, Ontario. This plant is reported to have a capacity of 75 tons per day,(1) or approximately 27,000 tons per year, sufficient to supply most of the estimated Canadian demand. The capacity is comparable to that of some of the large U.S. producers.

Pricing policy is complicated by the differences in form in which carbon dioxide can be supplied to the customer. The gas in cylinders is sold f.o.b. the supplier, with the customer paying freight to his destination and for return of the empty cylinder. Dry ice can be purchased either on a basis of weight delivered or weight at supplier's plant less two per cent allowance for shrinkage. Bulk liquid carbon dioxide is generally sold on a delivered basis. Liquid Carbonic installs 2½, 6 or 15 ton storage tanks at the customer's location and services these regularly by tank trucks. Prices in all forms vary according to the quantity purchased, with substantial discounts for large quantities. While freight equalization in the ordinary sense is not practiced, freight allowances are common to meet competitive situations.

Canadian prices are not published, but the pricing policy in the U.S.A. is very probably representative. In July 1965, published prices in the U.S.A. were as on the following page. They suggest the discounts that are available for bulk purchases and the relationship of the price of the bulk liquid to that of dry ice.

(1) Chemistry in Canada, Vol. 14, No. 1, Jan. 1962, p. 25

Prices of Carbon Dioxide, U.S.A.,
East of the Mississippi

	$U.S. per ton
Liquid, 500 to 1,000 tons per year[(a)]	60.00
Liquid, smaller quantities[(a)]	65.00 - 90.00
Solid (Dry Ice), bulk, wholesale, at works	
1,000,000 lb. or more per year	50.00
smaller quantities	60.00 -100.00

(a) Industrial, wholesale, bulk, delivered in metropolitan areas

Source: Oil, Paint and Drug Reporter, September 6, 1965

The price of $90 per ton for the liquefied gas would be charged consumers of small quantities; the $65 per ton charge would be to customers whose annual consumption approached one million pounds.

Foreign Trade

Until approximately 1960, imports of carbon dioxide appear to have been irregular and of negligible importance. Around 1960 there was a sharp increase in imports but Liquid Carbonic continued to supply by far the largest part of the Canadian demand. Published data for 1962 and 1963 show imports of the product in each year of $65,000. However, information available to the Board suggests that these represent only a small part of the actual imports. The spokesman for Liquid Carbonic claimed that imports had been bringing downward pressure to bear on prices.

The available information indicates that all, or almost all, imports were into Ontario and Quebec, a region in which Liquid Carbonic has been established for several decades. The company produces carbon dioxide at Toronto and Maitland, Ontario, and at Montreal and Quebec City, Quebec. In addition, there are several branch plants of the company in Ontario and Quebec to distribute carbon dioxide received from production centres.

There are no known exports of carbon dioxide.

CARBON MONOXIDE

Carbon monoxide is produced in Canada as a by-product of the manufacture of calcium carbide, by Shawinigan Chemicals Limited, at Shawinigan, Quebec. It is also produced as a by-product of other chemical processes. The product appears to have no commercial significance in Canada. Shawinigan Chemicals uses its carbon monoxide as a fuel.

NITROUS OXIDE

Nitrous oxide, also known as nitrogen monoxide and laughing gas, is a colourless, sweet-tasting gas which can be condensed under pressure into a colourless liquid. It is manufactured from ammonium nitrate which yields nitrous oxide and water on heating. In Canada a batch process is used, which was said to result in higher costs of production than the continuous process used by some larger plants in the U.S.A.(1)

In Canada, nitrous oxide is produced for sale by three companies: Canadian Liquid Air Company Limited at plants in Montreal and Vancouver, Canadian Oxygen Limited at Toronto and by Ohio Chemical Canada Limited at Montreal and Toronto. It was stated, at the public hearing in November 1960, that a large Canadian explosives manufacturer also makes nitrous oxide for his own use.

The principal use of nitrous oxide in Canada is as an anaesthetic. Very small amounts are sold for other uses such as the production of canned whipping cream and various food topping compounds. The extent to which nitrous oxide is used in preference to other anaesthetics depends on the judgment and preferences of anaesthetists and other professional experts; prices are not generally a major consideration in determining which anaesthetic is used.

Sales of nitrous oxide have been increasing rapidly in recent years with sales in 1961 valued at $914,000, more than double those in 1957, five years previously. This suggests that sales in 1964 exceeded one million dollars. At the public hearing, spokesmen for Canadian producers said that except for some imports into the Vancouver area, imports into Canada were unknown. There is no record of exports.

As with other gases, the development of methods of transporting the liquid form of the product in bulk has had a profound effect on the methods and costs of distribution. The cylinders weigh about four times as much as the gas they contain so that eight pounds of container must be shipped for every pound of gas, taking into account the return of the empty cylinder. The extension of the area in which the product can be transported economically, through shipments in bulk, was said to have increased the threat of imports from the U.S.A. However, because the bulk of the consumption is for medical purposes and in relatively small quantities, bulk shipments are a less significant part of the total than for some of the other gases.

The Canadian prices of nitrous oxide were said to be comparable with prices in the United States, but no published prices are available. The spokesman for Ohio Chemical stated that for some sizes of cylinders prices in Canada are lower than in the U.S.A.

TARIFF CONSIDERATIONS

The individual gases which are discussed in the foregoing are classified by headings 28.04 and 28.13 of the Brussels Tariff

(1) Transcript, Vol. 11, p. 1562

Nomenclature. When ruled to be of a kind not made in Canada, they are all entered under tariff item 208t, at rates of Free, B.P., and 15 p.c., M.F.N.; when ruled to be of a kind made in Canada, they are classified under tariff item 711, with rates of 15 p.c., B.P. and 20 p.c., M.F.N. Of the gases considered in this section, krypton, neon, xenon, carbon monoxide and the liquid forms of helium, argon and nitrous oxide are now classified under item 208t; hydrogen, nitrogen, oxygen, carbon dioxide and the gaseous forms of argon, helium and nitrous oxide are under item 711.

The Industry Committee, with the concurrence of the Canadian producers, urged that all of the above products be classified under tariff items worded like the B.T.N. headings in which they occur. The relevant headings and the gases to which they apply are as follows:

28.04 Hydrogen, rare gases and other non-metals
Applies to: hydrogen, helium, neon, argon, krypton and xenon

28.13 Other inorganic acids and oxygen compounds of non-metals (excluding water)
Applies to: carbon dioxide, carbon monoxide and nitrous oxide

As the foregoing discussion indicates, the inorganic gases are produced and distributed by only a few companies in Canada. In general the economic circumstances surrounding them are similar and the nature of the competition from imports and the tariffs which apply to them are also similar. In view of this and to avoid repetition the gases which have been discussed are dealt with as a group, except where the circumstances which apply are sufficiently different to warrant specific mention.

No representations were made by producers or consumers respecting helium, krypton, neon and xenon (heading 28.04) or carbon monoxide (heading 28.13). In general submissions, the Industry Committee urged that products for which no other representations were made should be subject to rates of 15 p.c., B.P. and 20 p.c., M.F.N. in items worded like the relevant headings of the B.T.N. The effect of the Committee's proposals, if implemented, would be to increase the rates for krypton, neon, xenon and carbon monoxide, from Free, B.P. and 15 p.c., M.F.N. under item 208t, to 15 p.c., B.P. and 20 p.c., M.F.N. Helium gas was ruled to be made in Canada effective May 4, 1964 and is therefore already subject to rates of 15 p.c., B.P. and 20 p.c., M.F.N.

The Committee did not indicate why the rates it proposed would be appropriate specifically for the products to which they were intended to apply. As noted, krypton, neon, xenon and carbon monoxide are not available commercially from Canadian production and are of small or negligible economic significance.

Apart from end-use interests, all of the proposals regarding the other gases under discussion were for rates of 15 p.c., B.P. and 20 p.c., M.F.N. A tabulation follows showing the various expressions of interest and the rates proposed, for the gases which are covered in this section.

	Proposed Rates B.P.	M.F.N.
Oxygen		
Linde Gases Div., Union Carbide Can. Ltd.	15 p.c.	20 p.c.
Canadian Oxygen Ltd.	15 p.c.	20 p.c.
Canadian Liquid Air Co. Ltd.	15 p.c.	20 p.c.
Liquid Carbonic Canadian Corporation Ltd.	15 p.c.	20 p.c.
Consolidated Mining and Smelting Co. of Can. Ltd.	no increase	
Canadian Pulp and Paper Assoc.	no increase	
Nitrogen		
Linde Gases	15 p.c.	20 p.c.
Canadian Oxygen Ltd.	15 p.c.	20 p.c.
Canadian Liquid Air Co. Ltd.	15 p.c.	20 p.c.
Liquid Carbonic Cdn. Corp.	15 p.c.	20 p.c.
Consolidated Mining and Smelting	no increase	
Canadian Pulp and Paper Assoc.	no increase	
Argon		
Linde Gases	15 p.c.	20 p.c.
Canadian Oxygen Ltd.	15 p.c.	20 p.c.
Canadian Liquid Air Co. Ltd.	15 p.c.	20 p.c.
Liquid Carbonic Cdn. Corp.	15 p.c.	20 p.c.
Consolidated Mining and Smelting	no increase	
Hydrogen		
Linde Gases	15 p.c.	20 p.c.
Canadian Oxygen Ltd.	15 p.c.	20 p.c.
Canadian Liquid Air Co. Ltd.	15 p.c.	20 p.c.
Liquid Carbonic Cdn. Corp.	15 p.c.	20 p.c.
Consolidated Mining and Smelting	no increase	
Canadian Pulp and Paper Assoc.	no increase	
Carbon Dioxide		
Liquid Carbonic Cdn. Corp.	15 p.c.	20 p.c.
Consolidated Mining and Smelting	no increase	
Nitrous Oxide		
Ohio Chemical Canada Ltd.	15 p.c.	20 p.c.

Source: Transcript, Vol 5, p. 715 (Cominco); Vol 7, p. 1062, 1086, 1088, 1090; Vol. 10, p. 1402 (Carbon dioxide); Vol. 11, p. 1555 (nitrous oxide); Vol. 85, p. 13006 (Pulp & Paper Assoc.)

The other interests that were made known to the Board, regarding the above gases, were as follows:

Naugatuck Chemicals Division of Dominion Rubber Company Limited supported the proposed rates of 15 p.c., B.P. and 20 p.c., M.F.N., for nitrogen and carbon dioxide. This support was conditional that "the Board also recommends those rates which will be proposed... for the products we manufacture."(1)

The Canadian Federation of Agriculture expressed its interest in nitrogen for use in pesticides. The Federation urged free entry for nitrogen when imported for use in the manufacture of pesticides.(2)

Polymer Corporation Limited also indicated its interest in nitrogen and carbon dioxide. Its spokesman urged continued free entry for materials used in the manufacture of synthetic rubber, in an item worded like tariff item 851.(3)

No other representations were made relating specifically to the gases under discussion.

In support of their rate proposals, the Canadian merchant-producers said that production costs were higher in Canada than in the United States, the only practical foreign source of supply. Liquid Carbonic claimed that machinery and other apparatus cost more in Canada because of the tariff protection of 20 p.c. and 22½ p.c. and that monoethanolamine, an important process material, costs more as a result of the existing 20 p.c. duty. Ohio Chemical said that the sole Canadian producer of the form of ammonium nitrate required for the manufacture of nitrous oxide takes advantage of most of the 10 p.c. protection afforded by the M.F.N. Tariff under item 208i.

Distribution costs also were said to be higher in Canada because of the dispersed nature of the market and the higher costs of distribution equipment. It was pointed out that cylinders are not made in Canada and are subject to a 20 p.c. duty on importation from the U.S.A. The consumer storage tanks for receipt of bulk shipments and the trailers and tank cars for transporting bulk liquid gases were also said to be more expensive in Canada.

The manufacturers stated that the smaller size of the Canadian market prevented them from achieving the economies of scale available to producers in the U.S.A. They claimed that, as a result, their costs were higher than in the U.S.A. and that they required the duty to protect their production and distribution facilities, particularly in the more vulnerable areas near the U.S. border. Production costs, however, were said to be a fairly small element of the selling prices.

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(1) Transcript, Vol. 10, p. 1487
(2) Same, Vol. 110, p. 16631
(3) Same, Vol. 89, p. 13501

In the past, difficulties and costs of transportation have favoured the location of producing units in close proximity to centres of use. This has limited both domestic and foreign competition to plants which were located near the same consuming area. The introduction of bulk transportation of liquefied gas has made longer distance haulage practical, but in Canada the cost of establishing and maintaining the necessary distribution system remains a major consideration in marketing these products nationally and to some extent limits the advantages to be had from the concentration of production facilities in a few centres. Manufacturers in the U.S.A. who seek to compete in the Canadian market face the same problems of distribution.

The most important commercial gas is oxygen, but most of the oxygen that is produced in Canada is sold in large quantities to purchasers for whom the on-site plants have been specially built. These sales are on a long term basis and are not sensitive to competition. For the oxygen which enters ordinary commerce, Canadian manufacturers appear to have substantially lower costs of transportation to most major consuming centres. The available data indicate that imports of oxygen are negligible.

Carbon dioxide is second to oxygen in commercial importance. Imports of this gas have increasedin the past few years although they continue to be only a small part of Canadian consumption. At the time of the public hearing on carbon dioxide, the Canadian producer claimed that there was a distinct threat from imports from the U.S.A. Since the hearing, the new plant at Maitland, Ontario, has come into production. It is comparable in size with the larger installations in the U.S.A. and is favourably situated both with respect to a large part of the market and to the gas which is used as its raw material. The Maitland plant has substantially lower transportation costs than the nearest competitors in the U.S.A. to markets east of Toronto; these markets would account for a large proportion of the company's sales.

Liquid Carbonic noted that the highly seasonal nature of the demand for carbon dioxide necessitated the maintenance in Canada of facilities considerably in excess of the annual requirements. The company claimed that it was at a disadvantage to producers in the U.S.A. because the seasonal demand fluctuations are less in the U.S.A. than in Canada. The company did not indicate the extent to which this factor affected its costs.

In general, imports appear most likely to occur in those areas which are relatively far from Canadian suppliers and closer to United States plants. Windsor and Niagara Falls, Ontario, were cited as locations vulnerable to competition from the U.S.A. The Canadian producers all expressed concern that the area which could be penetrated by imports would increase as a result of the development of methods of bulk shipments of liquefied gases. However, these methods should also increase the areas which can be served economically by the Canadian plants. There is no evidence of significant increases of imports in recent years.

It appears that domestic producers supply most of the Canadian market for the gases under discussion. The available information indicates that imports are negligible except for argon and

carbon dioxide. Imports of argon, valued at $195,000 in 1963, were estimated to be less than 10 per cent of sales in that year; imports of carbon dioxide are probably considerably less than five per cent of total sales.

Although it is cheaper to ship a gas as a liquid, in bulk, this is possible only if consumers have the means of storing and converting the liquid. This requires the installation and maintenance of converter units and storage tanks and regular servicing to meet customers' requirements. The established Canadian companies with branch plants at numerous locations across Canada probably have an advantage over potential competitors in gaining and retaining customers because of the service which they provide.

The costs of distribution, including transportation, and the Customs Tariff have undoubtedly been important factors in limiting imports of gases to very small amounts. Moreover, for some gases any cost disadvantages which do exist as a result of smaller-sized plants have not prevented the establishment of facilities by more than one producer in the large consuming centres such as Montreal and Toronto.

OTHER NON-METALS OF HEADING 28.04

In addition to the gases of heading 28.04 which were discussed earlier, six non-metals are classified in the heading, namely, phosphorus, silicon, selenium, tellurium, arsenic and boron. Phosphorus is presented first below. Of the remaining products, silicon was the only one which was the subject of specific representations; the discussion of this product follows. Selenium and tellurium are dealt with after silicon. Arsenic and boron do not appear to have economic significance. Because none of the last four was the subject of formal submissions they were dealt with together in the "tariff considerations" section which comes after the discussion of tellurium.

PHOSPHORUS

Phosphorus is a non-metallic element that exists in at least three allotropic forms, white, red and black. White phosphorus is a soft waxy solid which is white or pale yellow in colour. In commerce it is commonly known as "yellow phosphorus" and is so referred to in this report. It ignites spontaneously in moist air at about 30°C (86°F), is very poisonous and causes severe burns. Most of the yellow phosphorus produced is used in the manufacture of phosphoric acid and phosphates. It is also used in the manufacture of smoke screens and rat poisons and small amounts are converted into red phosphorus.

Red phosphorus is a violet-red, amorphous powder obtained from yellow phosphorus by heating in the presence of a catalyst such as iodine. It is non-poisonous and much less reactive than the yellow form. Red phosphorus is used in the manufacture of matches and fireworks.

Black phosphorus is a flaky, crystalline material that resembles graphite. It is insoluble in all known solvents and is

obtained by heating yellow phosphorus under high pressure. This form is not commercially significant.

In Canada, yellow phosphorus is manufactured from phosphate rock in electric furnaces. The phosphorus that is vaporized in this process is condensed to a liquid and then to a solid form; it is stored under a covering of water to prevent spontaneous ignition. It is shipped as a liquid in special tank cars equipped with steam coils and as a solid in protective metal containers.

The Market

Phosphorus is produced in Canada only by the Electric Reduction Company of Canada, Limited, (Erco). The company produces yellow phosphorus at Varennes, Quebec, most of which it transfers to its plant at Buckingham, Quebec. At Buckingham, a small amount is used in the production of amorphous or red phosphorus; the remainder is used for the production of phosphoric acid and other phosphorus compounds. At the public hearing, in September 1960, the company spokesman said:

> "over the past years, approximately 95 per cent of production /of phosphorus/ has been consumed in the company's own plants in the manufacture of phosphoric acid and phosphorus compounds. The Canadian market for elemental phosphorus is very small."(1)

Even though commercial sales have been only a fairly small part of the company's total production, the export market has been an important consideration in the company's operations. Exports have been to Great Britain and India, and at times to China and the U.S.A. The company spokesman mentioned that "...duty-free entry is advantageous in enabling the company to supply phosphorus to the United Kingdom which would not otherwise be possible."(2)

Imports of phosphorus are apparently negligible. At the public hearing, the company representative said "...at the moment, there is no active competition through importation of phosphorus into Canada."(3)

Transportation is an important factor of cost both with respect to the phosphorus and the raw material, phosphate rock. About 7.5 tons of phosphate rock of 70 B.P.L. grade are required to produce one ton of elemental phosphorus. Lower grades of rock can be used in the electro-thermal process, the cost of freight being an important consideration in the choice of which grade is used. Phosphate rock is shipped by water from Florida to Varennes, Quebec. Most producers in the U.S.A. also obtain their phosphate rock from Florida. Transportation costs for phosphate rock are lower to Varennes, Quebec than they are to the U.S. producer at Niagara Falls, N.Y., the nearest to the Canadian market. Other producers in the U.S.A. are located farther south, closer to the deposits of phosphate rock and, in some cases,

(1) Transcript, Vol. 7, p. 1022
(2) Same, Vol. 7, p. 1022
(3) Same, Vol. 7, p. 1023

in the region served by the Tennessee Valley Authority (TVA) where they are able to take advantage of the available low-cost power. However to compete in the Canadian market, they face the additional transportation cost on the phosphorus or other end-products.

The Canadian producer distributes elemental phosphorus from both Varennes and Buckingham, Quebec. For the comparatively small amount of phosphorus which is sold, it has a substantial freight advantage relative to potential U.S. competitors in supplying eastern Ontario and Quebec; the advantage is relatively small in southwestern Ontario.

Costs of Shipping Phosphorus by Tank Truck from Various Producing Locations to Selected Consuming Locations, October, 1963

	FROM:			
	Varennes Quebec	Buckingham Quebec	Niagara Falls New York	Columbia Tennessee
	- $ Can. per ton -			
TO:				
Montreal, Que.	..	13.20	43.00	..
Buckingham, Que.	8.00[(a)]	-	40.20	96.40
St. Cesaire, Que.	15.68	18.00	56.70	..
Toronto, Ont.	34.80	20.40	25.00	82.40
Hamilton, Ont.	36.40	21.40	23.20	..
London, Ont.	42.84	24.40	42.00	76.00
Pembroke, Ont.	27.16	14.40	56.00	97.80

(a) Contract rate

Source: Smith Transport, Rates Dept.

However, the prime concern of the Canadian manufacturer is not with the commercial market for phosphorus, which represents only about five per cent of its output, but with potential competition in the Canadian market for phosphates of which its manufacture accounts for about 90 per cent of the phosphorus which is produced. The major market for phosphates is the detergent industry which is concentrated mainly in the Toronto-Hamilton area of Ontario.

Pricing Policy and Prices

Phosphorus is priced f.o.b. plant, freight equalized. Published prices are for truckload quantities but in view of the small size of the Canadian market, it is probable that a significant proportion of total sales is in lesser amounts. In October 1963, in the U.S.A., yellow phosphorus in tank truckloads was quoted at 19 cents a pound; the solid in drums was 20 to $20\frac{1}{2}$ cents a pound and red phosphorus in truckloads, in drums, was 55 cents a pound. These prices appear to have been stable for several years. Canadian prices are not published.

Tariff Considerations

Phosphorus is entered under tariff item 208p: "phosphorus and compounds thereof, n.o.p.", free of duty under the B.P. Tariff and dutiable at 20 p.c. under the M.F.N. Tariff.

At the public hearing on September 16, 1960, the Electric Reduction Company of Canada, Limited urged that no change be made in the existing rates. The company also supported the recommendation of the Industry Committee for the classification of chemicals according to the Brussels Tariff Nomenclature.(1)

The Canadian Federation of Agriculture expressed its interest in phosphorus, as a constituent of pesticides. The Federation proposed that chemicals which are used in the manufacture of pesticides should be entered free of duty under all Tariffs.(2)

No other representations were made relating specifically to phosphorus.

In support of continuing the existing rates of duty, the spokesman for Erco said that some producers in the U.S.A. obtain their phosphate rock and electric power at lower cost. He also said that they were able to achieve economies of scale because of the larger size of their market and the consequent larger capacity of their installations. Differences in climate were cited as making Canadian buildings more expensive and it was urged that Canadian costs of equipment and operation are higher because much of the equipment must be imported and is dutiable on entry into Canada. The company spokesman estimated that costs of producing phosphorus by potential competitors in the U.S.A. were approximately 20 per cent lower than in Canada.(3)

The U.S. plant which is nearest the Canadian market is at Niagara Falls, N.Y., but no particular mention was made at the hearing concerning its competitive position. Most of the discussion centred around the advantages of the plants located in the Tennessee River Valley region.

The available information indicates that the laid-down cost of phosphate rock and electric power are lower in the Tennessee Valley than at Varennes, and that the furnaces of at least some plants operating in that region of the U.S.A. are larger than those in Canada. These plants, however, are located at a considerable distance from the Canadian market for phosphorus and phosphoric acid and their operating advantages would have to be very large to offset the disadvantage of their location with respect to the Canadian market. This disadvantage is from $33 to more than $80 a ton.

About 95 per cent of the phosphorus manufactured in Canada was said to be used captively to produce electro-thermal phosphoric acid, most of which, in turn, went into captive production of

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(1) Transcript, Vol. 7, p. 1022; Vol. 4, p. 673
(2) Same, Vol. 110, p. 16631
(3) Same, Vol. 7, p. 1024

phosphorus compounds. Therefore, the proposal for the maintenance of the present M.F.N. rate of duty of 20 p.c. can be viewed as directed primarily towards protecting the company's position as a supplier of phosphoric acid and phosphorus compounds. The company said that the 20 p.c. duty acts as a deterrent to the importation of phosphorus from the U.S.A. for conversion into the acid and phosphates.

In the company's view the establishment of an operation in Canada to produce phosphoric acid and phosphates from imported phosphorus would undermine Erco's position in the market and jeopardize its heavy capital investment; it would also have adverse effects on employment in the communities in which the company is an important employer.

The tabulation of freight rates shows that Erco's freight advantage on phosphorus is very substantial relative to the plants in the TVA area of the U.S.A. These plants were cited as being low-cost producers. Relative to Niagara Falls, N.Y., the situation is different. The freight advantage of the Buckingham plant is substantial east of Toronto but amounts to only $4.60 per ton at Toronto and $1.80 a ton at Hamilton. The Varennes plant is at a disadvantage relative to Niagara Falls, at both Toronto ($9.80 a ton) and Hamilton ($13.20 a ton).

However, plants located at Niagara Falls, New York, would incur higher freight costs than the Erco plant at Varennes on the phosphate rock which they obtained from Florida. Moreover, no evidence was presented to indicate that they enjoyed the advantages of lower costs of power at Niagara Falls as was reported to be the case with plants purchasing power from the TVA.

The spokesman for Erco said the company exports phosphorus, at times even to the U.S.A. He also said that there was no active competition from imports in the Canadian market. These facts suggest that advantages of location and perhaps other factors, in conjunction with the existing Tariff, have been sufficient to more than offset the advantages of producers in the U.S.A. This has been so in spite of the fact that Erco must transfer yellow phosphorus overland to Buckingham from Varennes, to produce red phosphorus, phosphoric acid and phosphates.

SILICON

Silicon has the appearance of a silvery grey metal but chemically bears a close resemblance to carbon. It occurs widely in combination with oxygen and constitutes about one quarter of the earth's crust. In commerce, it is commonly known as "silicon metal", and is distinguished from ferro-silicon by its relatively low iron content, usually less than 1.5 per cent.(1)

In Canada, silicon metal is produced from quartzite largely obtained from local deposits, by the Metals and Carbon Division of Union Carbide Canada Limited, at Beauharnois, Quebec. Established in

(1) Transcript, Vol. 7, p. 1051-2

1937, the plant remains the sole producer of silicon metal in Canada. In addition to silicon, the company produces ferro-silicon and a number of other products at Beauharnois.

The Market

The spokesman for Union Carbide said that the main use of silicon in Canada is in the manufacture of aluminum-silicon alloys which are used in castings of many kinds including automobile parts. The silicon content of these alloys is from 5 to 20 per cent. The only other significant market is in brass and bronze which uses about five per cent of the silicon sold in Canada. Some silicon is also used in the electronics industry. The company spokesman estimated that in 1960 an automobile contained about 60 pounds of aluminum, but by 1970, he expected that the content of aluminum per car would be about 290 pounds, almost five times as much,[(1)] suggesting a very substantial expansion in the use of silicon.

The spokesman also said that consumption of silicon in Canada had increased from less than 500 tons in 1951 to about 3,000 tons in 1960. Information available to the Board indicates that further increases have occurred since then. At the time of the hearing, September 1960, the company had completed an expansion of its silicon facilities in anticipation of the increasing domestic demand; the company estimated that this additional capacity would be sufficient to supply domestic requirements until 1964. Early in 1964 it was reported that the company was again expanding its silicon capacity by a substantial amount.

The company estimated that imports in 1951 supplied less than three per cent of Canadian requirements. Its spokesman claimed that imports had subsequently increased and in 1960 were supplying 25 per cent of Canadian use. It is noteworthy that the company's facilities were expanded in 1960 suggesting that at least part of the increased imports were to supplement Union Carbide's production. Imports in 1960 were of the order of $1 million and dropped to less than $50,000 in 1961. Imports again increased sharply in 1962, to $815,000, and in 1963, the latest year for which data are available, they were valued at $345,000.

According to the U.S. Minerals Yearbook, silicon metal was priced at about $21.50 per hundredweight in 1962. Thus, the imports in 1962 would have been approaching 4 million pounds and in 1963, about 1.6 million pounds. Union Carbide suggested that imports were largely from France and Italy.

No published data are available for exports. However, the company claimed that exports, which were once substantial, had declined as capacity for the production of silicon was installed or increased abroad. To some extent, the decline in exports may also have been due to the expanding domestic use, much of it for products which are themselves exported. The representative of Union Carbide estimated that about 75 per cent of Canadian consumption of silicon was exported in the form of finished goods into whose manufacture the product entered.[(2)]

(1) Transcript, Vol. 7, p. 1042
(2) Same, Vol. 7, p. 1055

Tariff Considerations

Silicon, of the grades ordinarily used in alloys, is entered under tariff item 711, at rates of 15 p.c., B.P. and 20 p.c., M.F.N. Silicon of the type used for the manufacture of safety fuses is entered under item 208t, as a chemical of a kind not produced in Canada, with rates of Free, B.P. and 15 p.c., M.F.N.

At the public hearing in September 1960, the spokesman for the Metals and Carbon Division of Union Carbide Canada Limited requested the maintenance of the existing rates of duty for "silicon metal which is classified under Brussels heading 28.04".(1) The discussion at the public hearing indicated that the company was, in fact, referring to the alloy grades of silicon which are now dutiable at 15 p.c., B.P. and 20 p.c., M.F.N. Heading 28.04 of the Brussels Tariff Nomenclature relates to the very pure grades as well as the alloy grades.

No other representations were made relating specifically to silicon.

In support of its proposal the company spokesman said that Union Carbide was facing decreasing export markets and loss of domestic sales as a result of the competition of countries with lower costs of production. He intimated that lower costs of labour in France and Italy, the principal competitors, were an important factor in the situation. He said that silicon was an important strategic material; that its production gave employment to a large number of Canadians; and that maintenance of existing tariffs would encourage Canadian production of the product.

The available evidence tends to confirm the company's claim that exports have declined and that imports in recent years have been larger than in the past. However, it is not clear that this situation results entirely, or even in large part, from the competition of imports in the Canadian market. The available data indicate that imports are ordinarily a small part of Canadian consumption and only occasionally are as large as they were in 1960 (about $1 million).

It seems significant that Union Carbide was expanding its plant in 1960 and that imports were valued at less than $50,000 in 1961, when the new installations were in operation. Imports were also large in 1962 and 1963, just before a further expansion of the company's facilities was reported. The addition of capacity in the face of substantial imports suggests a rapidly growing domestic demand with imports supplementing Canadian supplies.

It should be noted that about 75 per cent of Canadian use is for products which are exported. For this consumption drawback of duty could be claimed and therefore, for most of the domestic use, the company has no effective protection.

At the public hearing it was said that there might be difficulties in distinguishing between silicon metal and ferro-silicon, in the administration of the Tariff. Ferro-silicon is entered

(1) Transcript, Vol. 7, p. 1034

under tariff items 375(c), 375(d) and 375(e) which are not within the terms of Reference 120. Item 375(e) is worded as follows:

	British Preferential Tariff	Most-Favoured-Nation Tariff
Item 375(e)		
Ferro-silicon, being an alloy of iron and silicon containing 90 per centum or more, by weight of silicon—per pound, or fraction thereof, on the silicon contained therein...........	Free	5 cents

Silicon to which iron has been deliberately added is classified as an alloy under item 375e; if the iron occurs as a residual of purification, the product is classified by item 711. In the Brussels Nomenclature no account is taken of whether the iron occurs naturally or is added deliberately. The Explanatory Notes to the B.T.N. indicate that the product is to be classified in heading 73.02 if it contains not more than 96 per cent of non-ferrous alloy elements such as silicon, manganese, chromium, tungsten or other alloy elements. Thus silicon which contained four per cent or more of iron would be classified under heading 73.02; if it contained less than four per cent of iron, that is, if it were more than 96 per cent pure silicon, it would be classified under heading 28.04.(1) Union Carbide indicated that in its knowledge of the trade, "silicon metal" did not normally contain more than 1.5 per cent of iron.

If an item worded like B.T.N. heading 28.04 were introduced and the Explanatory Notes were used for its interpretation, it would be in conflict with item 375e, as administered, when the imported product contained more than 96 per cent silicon but to which iron had been deliberately added. The new item presumably would take precedence over item 711 for the product that contained more than 96 per cent of silicon but whose content of iron occurred naturally. Item 375e is outside the terms of Reference 120. The silicon dutiable under item 711 is also outside the terms of the Reference if silicon is regarded as a mineral and not as a chemical. The Industry Committee spokesman said he would classify it as does the B.T.N. to a "chemicals and allied products" section of the Customs Tariff.

SELENIUM

Selenium is a greyish non-metallic element of very high lustre which exists in the form of crystals or powder. It is obtained from anode muds of the electrolytic copper refining process. Selenium is produced in Canada as a by-product by International Nickel Company of Canada, Limited, at Copper Cliff, Ontario, and by Canadian Copper Refiners Limited at Montreal East, Quebec.

(1) Explanatory Notes to the Brussels Nomenclature, 1955, Vol. 2, p.659

Between 1950 and 1960 production of selenium approximately doubled in volume and almost trebled in value to about $3,600,000; in 1961 and 1962 both the volume and the value were somewhat lower.

Selenium; Production, Exports and Consumption, Selected Years, 1950-64

	Production[a]	Exports	Known Consumption[b]
	pounds of contained selenium		
1950	261,973	542,401	9,312
1956	330,389	409,729	31,669
1958	306,990	250,351	16,600
1960	521,638	404,410	14,461
1961	430,612	345,800	13,160
1962	487,066	325,600	12,587
1963	468,772	445,700	14,281
1964	448,750	401,300	13,968

(a) All forms, including in addition to refined selenium the recoverable selenium content of the blister copper produced from domestic ores
(b) 1950-1958, producers' domestic shipments; 1960-1964, consumption as reported by consumers

Source: Canadian Minerals Yearbook

Canadian consumption of selenium is a small part of the production and has not been increasing in recent years. Silicon and germanium are being substituted for selenium in the manufacture of electrical rectifiers, causing a decline in use of selenium by the electronics industry. In 1959, the electronics industry was the major domestic user of selenium and consumed about 8,400 pounds, more than one third of the total; in 1962, this industry was shown as using only about 1,600 pounds, about 13 per cent of the known Canadian consumption. Selenium is also used in the manufacture of glass, rubber, pharmaceuticals and alloy-steels.

Industrial Use of Selenium, 1959-62

Industry	1959	1960	1961	1962
	pounds of contained selenium			
Electronics	8,375	3,822	1,465	1,634
Glass	7,708	5,761	6,643	5,347
Other[a]	6,073	4,878	5,052	5,606
Total	22,156	14,461	13,160	12,587

(a) Includes rubber, steel and pharmaceuticals

Source: Department of Mines and Technical Surveys, Canadian Minerals Yearbook, 1960, 1962

Imports of selenium have been negligible. Exports, however, account for more than 90 per cent of the commercial sales. In the past five years, 1960-64, the value of exports has averaged about $2.3 million annually. More than 90 per cent of the exports typically go to the U.K. and the U.S.A.; small amounts are also exported to several other countries.

Exports of Selenium and Selenium Metal Powder[a]
By Principal Country of Destination, 1956-64

	U.K.		U.S.A.		Total	
	'000 lb.	$'000	'000 lb.	$'000	'000 lb.	$'000
1956	170	2,573	228	3,395	410	6,343
1957	91	1,263	135	1,421	228	2,739
1958	107	781	138	871	250	1,701
1959	146	1,114	170	665	326	1,846
1960	214	1,602	126	744	404	2,796
1961	213	1,414	100	619	346	2,252
1962	161	1,009	142	890	326	2,034
1963	190	1,063	230	1,216	446	2,422
1964	200	1,082	174	991	401	2,206

(a) Prior to 1961, "Selenium and Salts"

Source: D.B.S., Trade of Canada, Exports, s.c. 6650 and s.c. 40-037

Selenium prices are quoted on a delivered basis and vary according to the purity of the material. In 1963, prices in the U.S.A. were quoted at $4.50 to $5.75 per pound for commercial grade (99.5%) and $6.00 to $6.75 for the high purity grade (99.9%).[1]

TELLURIUM

Tellurium is a dark grey crystalline or amorphous powder. It is available commercially as a metallic powder, as a chemically precipitated powder and as small cast cakes. Tellurium is recovered with selenium by refining tankhouse slimes by the International Nickel Company of Canada, Limited and Canadian Copper Refiners Limited.

Tellurium is used in metal alloys, thermoelectric devices, in the manufacture of iron and stainless steel castings, as a secondary vulcanizing agent in the rubber industry and as a colouring agent in glass and ceramics.

(1) Canadian Minerals Yearbook, quoting from E. & M.J. Metal and Mineral Markets

Production of Tellurium, Selected Years, 1954-64

	All Forms	
	lb.	$
1954	8,171	14,300
1956	7,867	13,767
1960	44,682	156,388
1961	77,609	376,404
1962	58,725	352,350
1963	76,842	499,473
1964	79,789	508,830

Source: Canadian Minerals Yearbook

The level of production in recent years has been substantially higher than in the early 1950's. In 1962 Canada was the second largest producer in the non-communist world.

Consumption in Canada in 1962 was only about 4,300 pounds, about seven per cent of output; the remainder of the output was exported.(1) Imports have been negligible. In the U.S.A. the price of the commercial grade (99 per cent) in 1963 was quoted at $6.00 a pound.(2)

Tariff Considerations

Arsenic and boron appear to be of small economic importance in Canada. They are both entered under tariff item 208t, at rates of Free, B.P. and 15 p.c., M.F.N. The Canadian Federation of Agriculture expressed an interest in arsenic as a constituent of pesticides and in boron as a constituent of fertilizers. The Federation urged that, when imported for use for these purposes, both should be entered free of duty under all Tariffs.(3) If imported as a constituent for pesticides, arsenic could be entered duty-free under tariff item 791, and boron, if for use in the manufacture of fertilizers, duty-free under tariff item 663b.

Selenium and tellurium are entered under tariff item 711, at rates of 15 p.c., B.P. and 20 p.c., M.F.N. No representations were made to the Board specifically related to these products.

In general submissions, the Industry Committee urged that all products for which no other representations were made be subject to rates of 15 p.c., B.P. and 20 p.c., M.F.N., in an item worded like heading 28.04. This proposal would apply to arsenic and boron when they were imported for use other than in pesticides or fertilizers. The Committee did not indicate why these rates would be appropriate specifically for these products.

(1) Canadian Minerals Yearbook
(2) Same, quoting from E. & M.J. Metal and Mineral Markets
(3) Transcript, Vol. 110, p. 16631; Vol. 83, p. 12813

Neither arsenic nor boron is produced in Canada and neither appears to be economically significant. If the proposal of the Industry Committee were implemented, both would become subject to much higher rates of duty than at present, under item 208t. No statistical information is available to the Board regarding either chemical and no reasons were advanced by the Industry Committee why they specifically should be subjected to higher rates, nor indeed, to any rates. The proposed rates were those generally advanced for residual heading rates.

The value of shipments of selenium in 1964 was $2.2 million, and of tellurium $509,000. Most of the production of both products, 90 per cent or more of the total, is exported. This suggests that Canada competes successfully with other countries in sales of these non-metals. In the case of both products Canada is the second largest producer in the free world. In view of the foregoing, it is difficult to see why selenium and tellurium would require the protection of the rates proposed by the Industry Committee.

ALKALI, ALKALINE-EARTH AND RARE EARTH METALS; YTTRIUM AND SCANDIUM; MERCURY - B.T.N. 28.05

Heading 28.05 provides for 25 elements, most of which are not of commercial significance. One of the 25, mercury, is not within the scope of Reference 120. Of the 24 remaining elements of B.T.N. heading 28.05, only sodium was the subject of a formal submission. Some interest was also made known to the Board in five others, barium, calcium, lithium, strontium and cerium.

With the exception of mercury (tariff item 333) and the end-use provision for sodium under temporary item 263d, all of the elements of this heading are understood to be classified under tariff item 208t as chemicals of a kind not produced in Canada, free of duty under the British Preferential Tariff and dutiable at 15 p.c. under the Most-Favoured-Nation Tariff. It should be noted that barium, calcium, caesium, strontium and possibly lithium are produced in Canada and presumably would be so ruled for Customs purposes if a ruling were requested.

Sodium and calcium are discussed separately, followed by barium, cerium, lithium and strontium, dealt with as a group.

SODIUM

Sodium is a very abundant metallic element never found in its pure state in nature. Because of its readiness to combine with water, air and other substances, it is generally kept immersed in naphtha or some similar liquid, or under a blanket of nitrogen. Metallic sodium can be derived from various compounds by thermo-chemical reduction but the great bulk of the world's production is by the electrolytic dissociation of sodium chloride (salt) into sodium and chlorine. Sodium is not produced in Canada.

Metallic sodium is used principally in the manufacture of tetraethyl and tetramethyl lead motor fuel additives. In the U.S.A. motor fuel additives accounted for 73 per cent of the total consumption of sodium in 1962. Other lesser uses include the production of sodium cyanide, sodium peroxide and the refining of titanium and zirconium.

In 1963, there were five plants in the United States, with capacities ranging from 28,000 to 45,000 tons per year, operated by three companies.(1) The Ethyl Corporation, sole stockholder of the principal Canadian consumer, Ethyl Corporation of Canada Limited, Toronto, Ontario, is reported to operate plants in Louisiana and Texas which have a combined capacity of 75,000 tons per year, 43 per cent of the U.S. total. The other three plants are located at Memphis, Tennessee, Niagara Falls, New York and Ashtabula, Ohio. The first two of these each has reported annual capacities of 35,000 tons, the plant at Ashtabula, a capacity of 28,000 tons.

(1) Oil, Paint and Drug Reporter, June 24, 1963, p. 9

Ethyl Corporation of Canada Limited uses metallic sodium as an intermediate in the production of motor fuel additives at its plant near Sarnia, Ontario. At the public hearing on sodium, Ethyl of Canada indicated that it required some seven million pounds of sodium per year. This was said to represent at least 95 per cent of all sodium used in Canada.

Although no other consumers were identified at the public hearing on sodium, at the hearing on sodium azide in March 1961, Canadian Industries Limited referred to its use of metallic sodium as a raw material at Beloeil, Quebec. The company's requirements of sodium are small as the total market for sodium azide is less than 100,000 pounds per annum; sodium is only about one-third of the weight of sodium azide. Because 90 per cent of C.I.L.'s consumption of sodium is in materials that are exported, duty drawback is an important consideration to that company.(1)

Early in 1964, Du Pont, the second largest producer of metallic sodium in the U.S.A., announced that it would construct a plant to manufacture motor fuel additives at Maitland, Ontario.

The available information indicates that almost all imports of sodium have been from the U.S.A. In 1964, the first year for which published data are available, imports totalled 4,723 tons with a value of $1.6 million. Except for five tons which were imported from Britain, all imports originated in the U.S.A.

Both Ethyl Corporation and C.I.L. informed the Board that their purchases were from suppliers in the U.S.A. Ethyl of Canada advised the Board that it imports the product in tank cars. Sodium is loaded into tank cars while it is hot and in liquid form, but it solidifies in transit as it cools. On arrival at its destination it is heated and when the sodium becomes fluid it is pumped into storage tanks.(2)

The spokesman for Ethyl of Canada stated that of the intermediate materials which are used by the company in the production of tetraethyl lead (TEL) compounds, only sodium and ethylene dibromide must still be imported. He suggested that current Canadian consumption of sodium was too small for economic production of the metal in Canada. In 1964, the Canadian market absorbed about 4,700 tons; the annual capacity of the smallest plant in operation in the United States is 28,000 tons. Thus, the total use in Canada was only about one-sixth of the capacity of the smallest U.S. plant.

Tariff Considerations

At least 95 per cent of the imports of sodium have been entered under item 263d, free of duty under both the B.P. and M.F.N. Tariffs, "for use in the manufacture of tetraethyl lead, tetramethyl lead, mixed ethylmethyl leads, and compounds of all of the foregoing."

(1) Transcript, Vol. 34, p. 5024-5
(2) Same, Vol. 7, p. 1117

This temporary provision by Order-in-Council was first introduced in 1955. At the time of the public hearing in 1961, item 263d referred only to "tetraethyl lead or compounds thereof." Apart from end-use considerations, sodium would be entered under item 208t at rates of Free, B.P. and 15 p.c., M.F.N.

At the public hearing in March 1961, the spokesman for Ethyl Corporation of Canada proposed that permanent provision be made for sodium with free entry under both the B.P. and M.F.N. Tariffs, in an item worded as follows:

"Sodium for use in the manufacture of tetraethyl lead."(1)

The Canadian Pharmaceutical Manufacturers Association reported its interest in sodium and recommended rates of Free, B.P. and 15 p.c., M.F.N., until made in Canada, for chemicals used in the manufacture of pharmaceuticals, unless otherwise provided for.(2)

The spokesman for the Industry Committee opposed free entry on the basis of particular end-use considerations. He urged that if free entry were recommended it should not be restricted to particular applications. He also recommended that when sodium was ruled to be made in Canada rates of 15 p.c., B.P. and 20 p.c., M.F.N. should apply.(3)

The representative of Ethyl Corporation argued that because TEL compounds were dutiable at Free, B.P. and 5 p.c., M.F.N. it was necessary for his company to purchase sodium, an essential raw material, as cheaply as possible in order to meet the competition of foreign produced TEL compounds. He stated that the company had undertaken to produce TEL compounds in Canada only after it had been assured of free entry for the intermediates that it must import.

CALCIUM

Calcium has been produced commercially in Canada since 1945 by Dominion Magnesium Limited, one of the world's principal producers of calcium metal. The company also produces magnesium and thorium and small quantities of strontium, barium, zirconium and titanium. "Smelter output [of calcium]...is capable of immediate expansion since the metal is made with the same equipment and by methods similar to those used for the production of magnesium, which is the main product of the company."(4)

Dominion Magnesium produces four grades ranging in purity from 98 per cent of calcium (Grade 4) to the nominal 99.9 per cent purity of Grade 1. Calcium is produced in only a few countries. It is known to be produced in France and the U.S.A.

(1) Transcript, Vol. 7, p. 1099
(2) Same, Vol. 87, p. 13321
(3) Same, Vol. 7, p. 1122
(4) Canadian Minerals Yearbook, 1963

The Canadian Minerals Yearbook reports the following:

"Calcium metal is a reducing agent used in the manufacture of uranium, thorium and their compounds. The metal can also be used to reduce chromium, vanadium, zirconium, titanium and beryllium.

"In non-ferrous metallurgy, the main uses are in debismuthizing lead in fire refining and as a lead alloy additive for storage battery grids...Such high-quality batteries are standard for telephone transmission systems but the use does not yet extend to automobile type batteries...

"In chemical processes it is an absorbant for oxygen, nitrogen and hydrogen in purifying argon and other rare gases. It is also used for sulphur removal in petroleum products, for high purity chemicals and in isotope separation. The manufacture of calcium hydride is a major outlet for production."

Production of calcium increased rapidly between 1945 and 1949 and reached a peak in 1948 of 895,000 pounds valued at $1.7 million. Data are not available for the period 1950-55, but output and use declined during those years. In 1956, Canada produced 395,000 pounds and recently output of calcium metal has exceeded 100,000 pounds only in occasional years, about one-ninth of the production in 1948.

Production and Exports of Calcium, Selected Years, 1957-64

	Production		Exports	
	'000 lb.	$'000	'000 lb.	$'000
1957	221	282	61(a)	77
1959	67	76	65(a)	74
1961	99	101	111	117
1962	123	124	124	157
1963	99	117	92	109
1964	159	175	131	137

(a) Estimated

Source: Canadian Minerals Yearbook and D.B.S.

Canadian demand for calcium metal is only a few hundred pounds per year; most of the output is exported. The sharp drop in Canadian use was partly the result of the replacement of calcium by magnesium in the production of uranium and partly because of the reduction of Canadian output of uranium. The principal export markets for calcium are the U.S.A., the U.K., West Germany, India and Belgium and Luxembourg, but the product has also been shipped to several other countries.

Exports of Calcium by Principal Country of Destination, Selected Years, 1955-64

	U.S.A.	U.K.	West Germany	India	Belgium & Luxembourg	Others	Total
			- thousand dollars -				
1955	762.3	507.7	-	-	12.0	1.3	1,283.3
1957	24.8	7.9	-	.1	17.6	27.1	77.5
1959	7.0	36.3	6.3	14.0	9.9	*	73.6
1961	30.4	10.8	10.9	28.2	31.5	5.0	116.8
1962	54.0	44.1	23.4	22.3	5.1	8.4	157.2
1963	33.0	11.7	22.7	23.7	11.0	7.1	109.1
1964	57.9	13.7	14.0	20.2	9.8	21.5	137.1

Source: D.B.S., Trade of Canada, Exports, s.c. 6642, 40061

The prices quoted by Dominion Magnesium Limited throughout 1963 ranged from 80 cents a pound for Grade 4 (Commercial Grade) to $3.50 a pound for Grade 1 (Chemical Standard Grade), f.o.b. Haley. These prices have been unchanged for some years. Metallic calcium is dutiable at 15.5 p.c. ad valorem on importation into the U.S.A. from Canada.

Tariff Considerations

Calcium is classified as a chemical of a kind not produced in Canada, dutiable under tariff item 208t at rates of Free, B.P. and 15 p.c., M.F.N. If ruled made in Canada, it would be classified under item 711 at 15 p.c., B.P. and 20 p.c., M.F.N. The Canadian producer has apparently not sought the additional protection that would result from the made-in-Canada ruling.

In a letter to the Board, Dominion Magnesium Limited expressed its interest as a producer of calcium, barium and strontium of heading 28.05 and also of magnesium and thorium, classified under headings 77.01 and 81.04, respectively. The company's proposal and the reasons for it were expressed in the following terms:

> "Dominion Magnesium Limited is a producer of barium, strontium, calcium and thorium metals covered under Brussels heading 28.05 and is a producer of magnesium metal.
>
> "Since 85 to 90 per cent of such production is exported, no additional protective tariff is considered advisable because
> (1) if we are not competitive in Canada, we certainly would not be able to compete in foreign markets;
> (2) an increase in duty would invite retaliatory duties in our foreign markets.
>
> "With regard to (2) above, it is recommended that no change in tariff is made either as an increase or decrease, but that the Canadian representatives at G.A.T.T. be empowered to use these items in order to bargain for lower tariffs

against similar items abroad. Specifically to offer future reductions in these items contingent on reduced duties against calcium metal, thorium metal and magnesium metal entering the U.S."(1)

The Canadian Federation of Agriculture expressed an interest in calcium as a constituent of fertilizers. The Federation recommended free entry under all Tariffs for chemicals used in the manufacture of fertilizers.(2) It is doubtful whether elemental calcium is ever used for this purpose.

OTHER PRODUCTS OF HEADING 28.05

The letter from Dominion Magnesium Limited referred to barium and strontium metals, which are also classified in heading 28.05. The company's proposal and arguments would apply to these.

The Canadian Federation of Agriculture expressed its interest in barium as a constituent of pesticides. It urged free entry under all Tariffs, for chemicals used in the manufacture of pesticides.(3) If so used, the product could be entered at present duty-free under tariff item 791.

In a letter to the Board dated June 14, 1960, the Foote Mineral Company, Philadelphia, Pennsylvania, indicated an interest in lithium metal, which the company produces in the United States. However, the company made no recommendation regarding rates of duties for lithium metal.

In a general submission to the Board, the Consolidated Mining and Smelting Company of Canada Limited (Cominco) included lithium in a list of products of interest to the company, "some of which are produced by the company, but not sold." The company urged the Board to make no recommendation which might lead to retaliatory action by other countries or which might result in increasing the cost of manufacture of exported products.(4)

The Canadian Pharmaceutical Manufacturers Association included cerium in a list of products of minor economic importance to its members. The Association proposed rates of Free, B.P. and 15 p.c., M.F.N., until ruled to be made in Canada, for chemicals used in the manufacture of pharmaceuticals unless otherwise provided for.(5)

Mercury was the subject of representations by the Federation of Agriculture and the Pharmaceutical Manufacturers. However, in the Customs Tariff mercury is enumerated in tariff item 333, which is outside the terms of the present Reference.

(1) Transcript, Vol. 7, p. 1126-7
(2) Same, Vol. 83, p. 12813
(3) Same, Vol. 110, p. 16631
(4) Same, Vol. 5, p. 715
(5) Same, Vol. 87, p. 13321

The Industry Committee, which supported the adoption of a system of tariff classification based on the Brussels Tariff Nomenclature, urged that mercury be deleted from item 333 and be relocated, with no change in the existing rates of duty, in a new tariff item worded like heading 28.05 of the B.T.N. In this way the Committee hoped to retain the structure of the B.T.N. as far as possible.

No interest was reported to the Board with respect to the remaining 18 elements which are classified under B.T.N. heading 28.05 and there are no data available regarding them. The Industry Committee proposed that these be dutiable at rates of 15 p.c., B.P. and 20 p.c., M.F.N. The Committee's proposal was intended to apply to products which were not the subject of representations by others. It would also apply to products which, like cerium, were the subject of end-use recommendations when these products were imported for other uses.

As indicated in the introduction, the products of the heading, apart from mercury, would be classified under tariff item 208t at rates of Free, B.P. and 15 p.c., M.F.N. as long as they are regarded as not made in Canada for customs purposes.

All of the companies and associations which expressed an interest in these products (exclusive of sodium and calcium which are dealt with separately) recommended either free entry or low rates. The proposal of the Industry Committee would involve a very substantial increase in the existing rate under the B.P. Tariff and a reduction in the existing margin of Commonwealth preference from 15 p.c. to 5 p.c. for any of the products which became dutiable at the heading rate. The Committee did not indicate why rates of 15 p.c., B.P. and 20 p.c., M.F.N. are appropriate specifically for the products of this heading to which they were intended to apply, nor why the margin of preference should be reduced. The proposed rates of 15 p.c., B.P., 20 p.c., M.F.N. were regarded by the Committee as generally appropriate for chemicals for which no specific representations had been made.

HYDROCHLORIC ACID - B.T.N. 28.06

The Product and the Industry

Hydrogen chloride is a gas readily dissolved in water. The aqueous solution, known as hydrochloric or muriatic acid, is a clear, or slightly yellowish liquid which is corrosive and dangerous to handle. The hydrogen chloride gas, when liquefied, is generally known as anhydrous hydrogen chloride. The term 'hydrochloric acid', as used in this section, includes both the aqueous solution and the anhydrous product unless the context indicates otherwise.

Hydrochloric acid is produced by the reaction of hydrogen with chlorine, by the action of sulphuric acid on sodium chloride (common salt), and as a by-product of some chemical reactions. In Canada, the acid is produced commercially by all three methods. As much as two thirds of total output may be as a by-product of other manufacturing processes.

In 1962, eight companies reported production of hydrochloric acid at eleven plants. Eight of the plants reported only the aqueous solution, one reported only anhydrous hydrogen chloride, and two plants reported production of both forms.

Six of the eleven plants were located in Ontario, three in Quebec and two in Alberta. One of the plants in Ontario and one in Alberta began production in 1961 and another Ontario plant came into production in 1962. There were no plants producing hydrochloric acid in either the Atlantic provinces or British Columbia. The anhydrous product had been produced by two Quebec plants before 1961. In 1960 one Ontario plant also began its manufacture.

The Market

In terms of 100 per cent acid, it is estimated that Canada produced about 42,000 tons of hydrochloric acid in 1964. About one third of the production was probably consumed in the manufacture of chemicals by the plants which produced it and two thirds or about 28,000 tons were sold, mostly in the domestic market. These sales would have a value, f.o.b. producer's plant, of around $3.2 million.

Production, domestic use and sales of hydrochloric acid have been increasing rapidly in recent years. In 1964, estimated production was almost 75 per cent greater than in 1960; domestic use was 70 per cent greater and estimated sales were double what they had been only five years previously.

The principal uses of hydrochloric acid, in Canada, are in the production of chemicals, the processing and refining of mineral fuels and metals, in the fabrication of iron and steel products, and in the manufacture of pulp and paper. The chemical industry is by far the largest consumer of hydrochloric acid. In 1962, this industry accounted for more than 60 per cent of the known use.

Production, Imports, Exports, and Apparent Domestic Disappearance of Hydrochloric Acid, 1957-64

	Production	Imports[a][c]	Exports[a][b]	Domestic Disappearance
		- as tons of 100% acid -		
1957	22,385	729	3,699	19,415
1958	20,740	495	1,684	19,351
1959	24,183	261	1,684	22,760
1960	24,139	269	2,094	22,314
1961	40,195	298	1,635	38,858
1962	39,139	353	4,260	35,232
1963	41,000[d]	295	3,829	37,466
1964	42,000[d]	406	4,291	38,115

(a) Assumes 20° Bé.(31.45% acid) shipped, converted to 100% basis
(b) U.S. imports from Canada
(c) U.S. exports to Canada
(d) Estimated

Source: D.B.S., various publications and U.S. Import and Export Statistics

Consumption of Hydrochloric Acid (Including Anhydrous Hydrogen Chloride) by Selected Industry, 1960-62

	1960	1961	1962
		tons of 100% acid	
Industrial Chemicals[a]	11,770	18,898	17,955
Other Chemical Use	420	447	626
Metal Mines & Mineral Fuels	5,388	5,723	6,000[b]
Wire & Wire Goods	1,146	1,098	1,539
Other Metal Industries	1,261	1,320	1,335
Pulp and Paper	449	1,042	1,199
Other Known Uses	217	200	239
Total Accounted For	20,651	28,728	28,893

(a) Includes estimated captive use
(b) Estimated

Source: D.B.S., various publications

Most of the use by the chemical industry is of captively-produced acid. In 1962 the industry purchased only 4,334 tons of the 18,000 tons shown in the table, about 20 per cent of its total estimated consumption.

In Canada, hydrochloric acid is priced, f.o.b. plant, freight equalized; base prices are different in Eastern and Western Canada. The base price for "Eastern Canada", 20° Baumé (31.45 per cent) bulk

acid was $36 a ton in 1965, unchanged since at least 1952. At the public hearing the manufacturers' representative indicated that "Eastern Canada", for this purpose, was that part of Canada east of Alberta. The base price in Alberta, in 1960, was $45 a ton.

Published prices in the U.S.A. for bulk hydrochloric acid, 20° Baumé, f.o.b. plants, freight equalized, have been $U.S. 30 since 1953. It was said at the hearing that there was a surplus of hydrochloric acid in the southwestern and southern states, and that sales in that region were made substantially below the published price. However, in the northern United States, the most advantageous location for competition in the Canadian market, there was no surplus hydrochloric acid and the Canadian manufacturers stated that published base prices probably reflected the market situation.

Anhydrous hydrogen chloride is a much more expensive product. In 1965, in the U.S.A., the product, in bulk, was 25 cents a pound or $500 a ton in sellers' trailers. An equal amount of acid in solution would cost about $90 a ton.

The maximum concentration of hydrochloric acid in aqueous solution is about 38 per cent and the usual concentration for bulk sales in tank cars or tank trucks is approximately 31 per cent.(1) As a result, when the aqueous solution is shipped, more than two tons of water must be transported for each ton of acid. This makes long distance haulage of hydrochloric acid in solution a relatively more costly factor than, for example, for sulphuric acid, which is usually shipped in concentrations of 78 per cent or more.

At the public hearing in 1960, the spokesman for the Canadian producers described a new type of tank car which was then being introduced for the shipment of liquefied anhydrous hydrogen chloride. These cars are now in regular service and by eliminating the haulage of water contained in the solution form, make long distance haulage more economical. Shipments of anhydrous hydrogen chloride by Canadian plants were much larger in 1961 and 1962 after the introduction of these cars.

The Canadian market is supplied almost entirely by domestically-produced hydrochloric acid and anhydrous hydrogen chloride. Imports, all from the U.S.A., are typically about one per cent of Canadian use and reflect the dependence of British Columbia on imported supplies. Imports entered in British Columbia are ordinarily from 97 to 99 per cent of total imports.

In contrast, exports have been relatively large in recent years accounting for approximately 14 per cent of sales by Canadian producers. All exports are to the U.S.A. and are entered into that country free of duty. In the three years, 1962-64, exports to the U.S.A. averaged $U.S. 438,323 annually. Exports have increased sharply since 1961; in the three years, 1959-61, they averaged only $U.S. 151,114 per year, approximately one third of their more recent level.

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(1) Transcript, Vol. 8, p. 1207

Exports and Imports of Hydrochloric Acid (Including Anhydrous Hydrogen Chloride), Selected Years, 1955-64

	Imports			Exports[b]		
	tons[a]	$'000	$ per ton	tons[a]	$'000	$ per ton
1955	501	14	28.03	11,754	366	31.14
1957	2,319	58	25.15	11,762	397	33.79
1959	830	23	27.18	5,356	134	24.96
1961	947	29	30.72	5,198	147	28.19
1962	1,121	37	32.62	13,546	342	25.26
1963	937[b]	31[b]	32.73[b]	12,175	469	38.55
1964	1,291[b]	44[b]	34.45[b]	13,645	503	36.89

(a) Tons of product reported; probably 20° Bé. (31.45%) acid
(b) U.S. data, value in $U.S.

Source: D.B.S., Trade of Canada, Imports, s.c. 8003; United States Imports for Consumption, s.c. 8211200 and U.S. Exports, FT-140, s.c. 83070

Tariff Considerations

Hydrochloric acid (the solution) is entered under tariff items 217 and 217a.

Item 217	British Preferential Tariff	Most-Favoured-Nation Tariff
Sulphuric and muriatic acid, n.o.p. per one hundred pounds...........	17½ cts.	22½ cts.
Item 217a		
Sulphuric and muriatic acids, not including glass containers, when in packages weighing not more than 100 pounds per one hundred pounds...........	Free	22½ cts.

Anhydrous hydrogen chloride is entered under item 711 at rates of 15 p.c., B.P. and 20 p.c., M.F.N.

All imports of both products have been only from the U.S.A. so that the effective rate of duty under item 217 has been 22½ cents per hundred pounds, or $4.50 per ton. In the latest ten years for which data are available, 1954-63, the duty collected on imports of hydrochloric acid in solution ranged from 15 per cent to 18 per cent of the dutiable value. In the five years, 1959-63, the duty collected was equivalent to an average of 15.4 p.c. ad valorem.

In the U.S.A. in 1965, anhydrous hydrogen chloride, in bulk, was priced at 25 cents a pound if shipped in the seller's trailers. At 25 cents a pound, or $500 a ton, the duty, under item 711, would be equivalent to specific duty of $100 per ton on a product of 100 per cent acid basis. The existing specific duty on hydrogen chloride in solution, under item 217, would be approximately $14 a ton, in terms of 100 per cent concentration.

At the public hearing in September 1960, six manufacturers of hydrochloric acid made a joint presentation in which they requested that hydrochloric acid and anhydrous hydrogen chloride be classified in an item worded like heading 28.06 of the Brussels Tariff Nomenclature, "hydrochloric acid and chlorosulphonic acid", with rates of 15 p.c., B.P. and 20 p.c., M.F.N.(1)

The manufacturers of the acid who participated in this joint presentation were as follows:

Company	Plant Location
Allied Chemicals Canada Limited	Sulphide, Ont.
Canadian Industries Limited	Shawinigan, Que.
	Cornwall, Ont.
	Hamilton, Ont.
Dow Chemical of Canada Limited	Sarnia, Ont.
Du Pont of Canada Limited	Maitland, Ont.
Shawinigan Chemicals Limited	Shawinigan, Que.
Western Chemicals Limited	Two Hills, Alta.

They were supported by the Electric Reduction Company of Canada Limited, a consumer of imported acid at its plant in British Columbia, and a producer of some by-product acid at Buckingham, Quebec.(2)

Naugatuck Chemicals Division of Dominion Rubber Limited, also supported rates of 15 p.c., B.P. and 20 p.c., M.F.N., in a general submission.(3) The company produces hydrochloric acid at Elmira, Ontario and Clover Bar, Alberta, but was not associated with the joint brief of the other producers.

Consolidated Mining and Smelting Company of Canada Limited (Cominco) opposed any increase in the rates of duty on chemicals used by Canadian manufacturers.(4) Cominco produces hydrochloric acid for captive use in British Columbia.

The Canadian Pulp and Paper Association also opposed any increase in rates for chemicals used by its members, including hydrochloric acid.(5)

(1) Transcript, Vol. 8, p. 1226, 1138
(2) Same, Vol. 9, p. 1276
(3) Same, Vol. 6, p. 901
(4) Same, Vol. 5, p. 715
(5) Same, Vol. 85, p. 13006

The Canadian Federation of Agriculture listed hydrochloric acid as a material used in the manufacture of pesticides and urged free entry for chemicals so used.(1)

Polymer Corporation Limited expressed its interest in hydrochloric acid as a product used in the manufacture of synthetic rubber. Polymer urged that the provisions of end-use item 851 with free entry for materials used in the manufacture of synthetic rubber, be continued.(2)

The Canadian Pharmaceutical Manufacturers Association indicated its interest in hydrochloric acid as a relatively minor chemical used by its members. The Association recommended that chemicals made in Canada and used in the manufacture of pharmaceuticals be dutiable at rates of 15 p.c., B.P. and 20 p.c., M.F.N.(3)

As noted earlier, all imports have been from the U.S.A. The ad valorem equivalent of the M.F.N. duty under item 217 at prices current in the U.S.A., in 1965, of $30 a ton would be 15 p.c., ad valorem. In carboys, some of which would be imported under item 217a, hydrochloric acid, 20° Bé, in carloads, was priced at 15.75 cents a pound in the U.S.A., in 1965, or $315 a ton. A duty of 20 p.c., at this price, would amount to $63 a ton on imports in carboys containing 100 pounds or less of acid.

Thus for hydrochloric acid in solution the proposal of the manufacturers would involve an increase in the effective duty from the equivalent of approximately 15 p.c. to 20 p.c. On imports of the acid in carboys containing 100 pounds or less acid, the duty at prices current in 1965 would be increased from the equivalent of about 1.4 p.c. to 20 p.c.

For anhydrous hydrogen chloride, the proposal of the manufacturers would leave the existing rates, under tariff item 711, unchanged.

In support of their proposal, the manufacturers of hydrochloric acid expressed concern lest surplus acid from the southern U.S.A. be sold in Canada; the introduction of tank cars for anhydrous hydrogen chloride was cited as a factor which would facilitate such a movement. They also referred to the smaller size of Canadian plants and claimed to be at a disadvantage relative to foreign suppliers because they supplied costly technical services to their customers whereas foreign suppliers ordinarily did not do so when selling in Canada.

Those who opposed any increase in rates did so mainly in general submissions. They generally expressed concern at the probable increase in their costs if the rates of duty on chemicals which they used were increased. They claimed that increases in their costs of manufacture would make them less able to compete with foreign producers both in the domestic and export markets.

(1) Transcript, Vol. 110, p. 16631
(2) Same, Vol. 89, p. 13501
(3) Same, Vol. 87, p. 13321

Imports of hydrochloric acid and anhydrous hydrogen chloride are very small relative to domestic use, sales in Canada or to exports. Imports are almost entirely into British Columbia which accounts for 97 to 99 per cent of the total.

At the time of the hearing the base prices in Canada for 20° Bé acid were $36 a ton east of Alberta and $45 a ton in Alberta, compared with a base price in the U.S.A. of $30 a ton. The base price east of Alberta has been 20 per cent higher than in the U.S.A. since at least 1952 and this differential was in effect in 1965. In Alberta the Canadian-produced acid was priced at 50 per cent more than in the U.S.A., at the time of the hearing.

The Electric Reduction Company (Erco), a major consumer of the acid in British Columbia, informed the Board that it was cheaper to import the acid from the U.S.A. than to purchase it in Alberta. The company spokesman said Erco had been advised by one of the Alberta producers that it could not supply hydrochloric acid at prices competitive with the imported product.

Except for British Columbia, nearly all the Canadian demand is supplied by Canadian producers. Although concern was expressed by the manufacturers that the use of tank cars for shipment of anhydrous hydrogen chloride might affect them adversely, since 1960, shipments of the anhydrous product by Canadian producers have increased substantially and there is no evidence that imports of the anhydrous product have increased. Total imports into Central and Eastern Canada have remained negligible.

A representative of the manufacturers indicated that the cost of transportation was the reason why acid from the U.S.A. was unable to compete in the Central Canadian market and explained that acid was imported into British Columbia because the nearest plant in the U.S.A., at Seattle, Washington, was much nearer than any Canadian plant. The fact that the Alberta producer could maintain a base price of $45 a ton in his market, principally in Alberta, when the price of potentially competitive United States acid was $27 to $30 a ton, indicates the importance of location as a competitive element.

The statement was made at the hearing that "... hydrochloric acid is a by-product of the production of chlorinated hydrocarbon, and the $36 price in Canada is primarily an attempt to get a contribution to the economics of the production of chlorinated hydrocarbon..."(1)

Although about two thirds of the hydrochloric acid produced in Canada is in plants which can obtain the acid as a by-product, these plants also produce chlorine and can manufacture the acid directly from chlorine. No evidence was presented to indicate why a base price of $36 a ton, 20 per cent higher than in the U.S.A., was appropriate for by-product acid nor why a tariff of 20 p.c., M.F.N. was necessary, especially since the producers who participated in the proposal were, since 1962, exporting more than ten times the value of total imports, and imports into their principal market area were negligible.

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(1) Transcript, Vol. 8, p. 1218

It is particularly difficult to see why a B.P. Tariff of 15 p.c. would be necessary in the light of the fact that there have been no known imports of hydrochloric acid from Commonwealth countries.

As noted, the manufacturers cited their technical services as a cost which placed them at a disadvantage to producers in the U.S.A. However, they conceded that their ability to supply such services was a factor in gaining and holding customers.

The appropriate classification of anhydrous hydrogen chloride in the Customs Tariff was discussed by the spokesman for the manufacturers of acids. In the B.T.N., hydrochloric acid (the solution) and anhydrous hydrogen chloride are classified under heading 28.06 which specifies "hydrochloric acid and chlorosulphonic acid". In the administration of the existing Tariff anhydrous hydrogen chloride is not considered to be hydrochloric acid and is classified as an unenumerated product under tariff item 711. In view of this the spokesman for the manufacturers urged that in order that both products should be classified in heading 28.06 that the heading should be amended by the inclusion of the words "anhydrous hydrogen chloride".

CHLOROSULPHONIC ACID - B.T.N. 28.06

Chlorosulphonic acid is produced by the reaction of hydrogen chloride with sulphur trioxide or oleum (a solution of sulphur trioxide in sulphuric acid). It is a highly corrosive, colourless or brownish liquid, with an irritating odour. It fumes in a humid atmosphere and decomposes on contact with water or if heated.

Its major use in Canada is in the manufacture of detergents and surface-active products. About 750 to 800 tons of the acid were said to be used annually, almost all of it by the detergent industry. It is not produced in Canada, and all supplies are imported from the U.S.A. At the published prices, in 1960, imports would be valued at about $70,000. In 1962, imports were valued at $65,000. It was said that this acid allows the production of relatively salt-free liquid detergents; in this application it was claimed to be the most economical chemical to use.(1)

Chlorosulphonic acid is made in the U.S.A. by three manufacturers, E.I. du Pont de Nemours and Company Incorporated at Grasselli, New Jersey, Monsanto Chemical Company at Monsanto, Illinois, and the Tennessee Corporation, at Atlanta, Georgia. The chemical is sold in carboys, drums and tank cars, f.o.b. works, freight equalized. In 1957 the base price in tank cars declined from $U.S. 90 a ton to $U.S. 83 a ton. The latter price was unchanged in mid-1965. In 1960, the delivered price to Canadian consumers was stated to be $120 a ton.(2)

Chlorosulphonic acid is entered under tariff item 216, "acids, n.o.p., of a kind not produced in Canada", free of duty under the British Preferential Tariff and dutiable at 15 p.c. under the Most-Favoured-Nation Tariff. Because all imports are from the U.S.A., the effective rate of duty is 15 p.c., the M.F.N. rate.

(1) Transcript, Vol. 9, p. 1317
(2) Same, Vol. 9, p. 1323

Four major consumers of the chemical urged that the acid should be entered free of duty until such time as it was ruled made in Canada.(1) Their spokesmen did not oppose a proposal that when so ruled the product should be dutiable at 15 p.c., B.P. and 20 p.c., M.F.N.(2) The four companies were:

Canada Packers Limited, Toronto, Ontario
Lever Brothers Limited, Toronto, Ontario
Procter and Gamble Company of Canada Limited, Toronto, Ontario
Swift Canadian Company Limited, Toronto, Ontario

A group of acid manufacturers opposed this proposal. Their spokesman urged that chlorosulphonic acid should continue to be dutiable at the existing rates of Free, B.P. and 15 p.c., M.F.N. until ruled made in Canada.(3)

The Canadian Pharmaceutical Manufacturers Association recommended rates of Free, B.P. and 15 p.c., M.F.N., unless otherwise provided for, for chemicals not made in Canada and used in the manufacture of pharmaceuticals.(4) The Association expressed an interest in chlorosulphonic acid as a chemical so used.

The representatives of the four soap and detergent manufacturers said that chlorosulphonic acid was not being manufactured in Canada and that no substitutes were available for it. They also said, "Because of the size of the market and the heavy capital investment involved we do not believe it is ever likely to be made in Canada."(5) They argued that the imposition of a duty on this acid would confer no benefit on Canadian producers but would tend to raise the cost of finished goods to the public.

The manufacturers of acids, who presented a joint brief to the Board respecting the major inorganic acids which occur under B.T.N. headings 28.06, 28.08 and 28.09, opposed the recommendation of the consumers of chlorosulphonic acid in the following terms. Their spokesman said:

"Duty free status for any chemical is, in itself, a deterrent to the manufacturer of that material in Canada...

"All that we ask and urge is that if an exception is made, ... that such an item in the tariff should be qualified so that as and when chlorosulphonic acid is deemed to be made in Canada that it will no longer qualify for entry under that exception."(6)

No other formal presentations were made to the Board. In his cross-examination of witnesses the spokesman for the Consolidated Mining and Smelting Company of Canada Limited indicated his company's opposition to the proposal that the product should necessarily become

(1) Transcript, Vol. 9, p. 1318, 1327, 1332
(2) Same, Vol. 9, p. 1321-2, 1332; Vol. 13, p. 1900
(3) Same, Vol. 9, p. 1341, 1343
(4) Same, Vol. 87, p. 13321
(5) Same, Vol. 9, p. 1331
(6) Same, Vol. 9, p. 1341, 1343

dutiable at the proposed rates when ruled to be made in Canada. He made the point that even if his company were to undertake production in British Columbia and the product was ruled to be made in Canada, costs of transportation would make shipment to the Ontario market uneconomic. He urged that, because of such regional considerations, some products should remain duty-free even when ruled to be made in Canada and not be subjected to a duty which would have to be paid by a consumer in one region without benefiting a producer in that or any other region.(1)

The submission of the three soap manufacturers that there are no economic substitutes for this acid in the manufacture of detergents was not questioned by the merchant-producers of acids, nor was their claim that the market in Canada is likely to be too small for several years to justify Canadian production. Even in the U.S.A., in 1960, there were only three plants which manufactured the product, none of them west of the Mississippi River.

The two plants in the U.S.A. which are nearest to the main Canadian consumption area around Hamilton, Ontario, are located at Grasselli, New Jersey and Monsanto, Illinois. Chlorosulphonic acid is costly to transport and the delivered price was said to be $120 a ton in 1960. At that time, freight was approximately $14 a ton and the price of the acid in the U.S.A. was $U.S. 83 a ton, or $ Can. 80.72 a ton. Thus, if production were undertaken in Canada near the major consuming area of Toronto and Hamilton, the apparent protection of the freight cost in 1960 would have been equivalent to about 17 per cent ad valorem.

(1) Transcript, Vol. 9, 1322-3, 1335-6

SULPHUR DIOXIDE - B.T.N. 28.07

The Product and the Industry

Sulphur dioxide is a colourless gas at ordinary temperatures and pressures but can be easily liquefied. It is very irritating to animal membranes and has a strong characteristic odour which is readily detectable in the atmosphere in very low concentrations. Because it is toxic to human beings and destructive of vegetation it cannot be discharged into the atmosphere in any appreciable concentration. When it occurs as a necessary result of production, it must be removed from the waste gases which are vented.

In Canada, sulphur dioxide is produced by burning elemental sulphur in air or by recovering it from waste gases of smelters and oil refineries. Although large quantities of sulphur dioxide are recovered from waste gases, only a small proportion enters commerce as sulphur dioxide. Most of the sulphur dioxide which is extracted from waste gases is converted into sulphuric acid for captive use or sale.

This section deals with sulphur dioxide sold as such, in relatively pure form; it does not deal with the sulphur dioxide which occurs as an intermediate product in other manufacturing processes.

When sulphur is burned it combines with the oxygen of the air to form sulphur dioxide. Two tons of sulphur dioxide are produced for every ton of sulphur burned, if there is no waste in the process. The gas, which is produced in special installations of many pulp and paper plants, has a concentration of approximately 16 per cent of sulphur dioxide. The remaining 84 per cent is made up of impurities. The presence of impurities makes the gas, thus obtained, unsuitable for some applications. However, this impure gas is suitable for use in cooking sulphite pulp and in this use it competes directly with purified sulphur dioxide.

In 1961 there were two commercial producers of sulphur dioxide in Canada, Canadian Industries Limited (C.I.L.) which began production at Copper Cliff, Ontario in 1953 and Consolidated Mining and Smelting Company of Canada Limited (Cominco) which began production at Trail, British Columbia in 1955.

The C.I.L. plant produces sulphur dioxide from smelter gas that is supplied under an arrangement with the International Nickel Company. This is a very rich gas which contains about 75 per cent of sulphur dioxide. The plant has a designed capacity of 94,000 tons a year but the amount of by-product gas available has not been sufficient to allow it to be operated at capacity.(1) It produces most of the commercial sulphur dioxide produced or sold in Canada. The Cominco plant is much smaller; its capacity in 1960 was estimated at 1,500 tons a year.(2) The largest producer in the U.S.A., in November 1963, had a capacity of 28,000 tons annually. Total capacity in the U.S.A., at that date, was 126,000 tons.(3)

(1) Transcript, Vol. 9, p. 1346-7
(2) Same, Vol. 9, p. 1349
(3) Oil, Paint and Drug Reporter, Nov. 11, 1963

The Market

By far the largest consumer of sulphur dioxide in Canada is the pulp and paper industry which uses it in cooking sulphite pulp (the principal application) and in the production of chlorine dioxide for bleaching pulp. Prior to 1953, little if any sulphur dioxide was used for cooking sulphite pulp. Liquefied sulphur dioxide is also used in relatively small amounts for several purposes including the recovery of metals and the preservation of foods.

In 1962 the pulp and paper industry reported the consumption of 82,000 tons of sulphur dioxide valued at more than $2 million; in 1952 this industry used only 1,100 tons valued at $82,000. Information given at the public hearing suggests that other uses of sulphur dioxide account for less than 1,000 tons annually. Thus it appears that the pulp and paper industry accounts for about 99 per cent of Canadian consumption of the product.

Sulphur Dioxide Used in the Manufacture of Wood Pulp, Selected Years, 1951-61

	Quantity Used	Value at User's Plant	
	'000 tons	$'000	$ per ton
1951	0.6	77	118.19
1952	1.1	82	71.74
1953	23.2	657	28.26
1956	69.2	1,815	26.25
1959	67.0	1,761	26.28
1960	81.0	2,048	25.28
1961	82.0	1,981	24.16
1962	82.0	2,014	24.56

Source: D.B.S., The Pulp and Paper Industry, Cat. No. 36-204

Before 1953, when commercial production of purified sulphur dioxide began in Canada, sulphite pulp mills had their own sulphur-burning equipment and all or almost all the sulphur dioxide used in the cooking of sulphite pulp was generated by burning elemental sulphur. During this period the price of sulphur fluctuated around $20 per ton while liquefied sulphur dioxide was priced at $90 per ton, both prices f.o.b. suppliers in the U.S.A.

Because one ton of sulphur would produce two tons of sulphur dioxide, at these prices it was much cheaper to burn sulphur and generate sulphur dioxide captively, even though this involved the installation and operation of special equipment. When C.I.L. began to produce sulphur dioxide at Copper Cliff in large quantities, the product was made available at a very much lower price when it was to be used in cooking sulphite pulp. The convenience of using liquid sulphur dioxide in conjunction with a price which made it competitive with elemental sulphur resulted in the very large increase in use which is shown in the preceding table. The table also indicates the sharp drop in cost to consumers, from more than $100 a ton delivered to about $25 a ton delivered.

However, although the use of liquid sulphur dioxide increased rapidly, the even more rapidly growing demand for the product still left elemental sulphur as the principal source of the chemical. In 1962 the pulp and paper industry used 315,000 tons of sulphur, equivalent to about 630,000 tons of sulphur dioxide, or almost four times as much as was used in the form of liquefied sulphur dioxide. In 1953, the first year that C.I.L. was in production, this industry used 258,000 tons of sulphur.

Most of the Canadian market for sulphur dioxide is in Ontario and Quebec, with British Columbia the only other important market area. In 1959, the last year for which such details are available, 97 per cent of the Canadian consumption was east of the Lakehead. In that year 63,000 of the 70,000 tons used in Ontario and Quebec were for cooking sulphite pulp. For this purpose it competes with elemental sulphur and returns a lower price to the producer than when it can be sold for bleaching pulp. Thus in Central Canada, only about 10 per cent of the sales in 1959 were for uses for which impure sulphur dioxide was unsuited.

Canadian foreign trade in sulphur dioxide has been relatively unimportant. Before 1953 total domestic use was only about 1,000 tons annually. After 1952 the delivered price of Canadian product to pulp and paper plants averaged between $25 and $28 a ton. During this period (1953-64) the price in the U.S.A., f.o.b. plant, was $90 a ton and the comparable delivered price to Canadian users would have been more than $100 a ton. In spite of this great difference in prices, the available information indicates that exports to the U.S.A. have been negligible; the absence of exports apparently reflected the lack of available supplies for export.

In the United States, the price quoted for liquefied sulphur dioxide in tank cars at works has been $90 per ton for many years. When C.I.L. began production in Canada in 1953, it established a price of $25 per ton in Canadian funds, and this price was still in effect in 1965. The available information indicates that in the U.S.A. liquefied sulphur dioxide is not purchased for use in cooking sulphite pulp.

Prices of Sulphur Dioxide in Canada and in the U.S.A., Liquid, Tank Cars, at Works, Selected Years, 1953-64

	U.S.A.(a)		Copper Cliff, Ont.
	$U.S. per ton	$Can. per ton	$Can. per ton
1953	90.00	88.51	25.00
1955	90.00	88.77	25.00
1957	90.00	86.29	25.00
1959	90.00	86.31	25.00
1960	90.00	87.27	25.00
1961	90.00	91.19	25.00
1962	90.00	96.20	25.00
1963	90.00	97.07	25.00
1964	90.00	97.07	25.00

(a) Converted to $Can. on basis of annual average, noon, spot rate of exchange

Source: U.S.A. prices from Oil, Paint and Drug Reporter; Canadian prices from Canadian Chemical Processing

Because liquid sulphur dioxide can be purchased from C.I.L. for about one-quarter the price of the product in the U.S.A., the Canadian company is not exposed to effective competition from imports. The nearest plants in the U.S.A. of significant size are located at Marinette, Wisconsin and Columbus, Ohio, a considerable distance from the major Canadian consumers. C.I.L.'s location at Copper Cliff, Ontario, is relatively close to many of the major consumers and this gives the company an additional advantage over potential competition from the U.S.A.

The principal competition faced by sulphur dioxide arises from the use of elemental sulphur by pulp and paper companies which have the necessary equipment to convert sulphur into sulphur dioxide. In 1965 the published price of sulphur dioxide for cooking sulphite pulp was $25 a ton, f.o.b. plant, and the price of an equivalent amount of elemental sulphur (one-half ton) was about $14. The cost of freight to major consuming locations was about the same for both products. Thus, if sulphur dioxide is to be sold in competition with elemental sulphur, substantial price concessions are likely to be necessary. At the public hearing the C.I.L. spokesman indicated that such was the case.(1)

Tariff Considerations

Sulphur dioxide is entered as an unenumerated chemical under tariff item 711 and bears rates of 15 p.c., B.P. and 20 p.c., M.F.N.

At the public hearing in September 1960, Canadian Industries Limited proposed that the existing rates of duty remain unchanged and that the product be separately enumerated in the Customs Tariff in an item worded like heading 28.07 of the B.T.N.(2)

Consolidated Mining and Smelting Company of Canada Limited informed the Board of its interest in the product both as a producer and user and urged that there be no increase in the existing rates for chemicals used by Canadian manufacturers.(3)

The Canadian Pulp and Paper Association, whose members are by far the largest consumers of sulphur dioxide in Canada, strongly opposed any increase in rates for chemicals used by its members.(4)

The Canadian Federation of Agriculture listed sulphur dioxide as a chemical used in the manufacture of pesticides. The Federation urged that chemicals used for this purpose should be entered free of duty under all Tariffs.(5) They may be so entered at present under tariff item 791.

In support of the rates proposed by the company, the spokesman for C.I.L. stated that the existing duty is causing no hardship to consumers and in fact that consumers are obtaining supplies at a much lower cost than they could import them free of duty. He conceded that

(1) Transcript, Vol. 9, p. 1348
(2) Same, Vol. 9, p. 1349
(3) Same, Vol. 5, p. 715
(4) Same, Vol. 85, p. 13006
(5) Same, Vol. 110, p. 16631

there was no significant competition from imported sulphur dioxide and that the chemical competes mainly with elemental sulphur. However, he argued that the chemical industry is one of rapid change and the retention of the existing rates would guard against unforeseen circumstances which might require such protection.

As indicated earlier the listed price of C.I.L.'s sulphur dioxide has been $25 a ton, $65 less per ton than the comparable price in the U.S.A. In addition, the company has a substantial freight advantage over potential competition from the U.S.A. to virtually all major consuming locations east of the Lakehead.

The company's sales are limited, at least at times, not by competitive importations of sulphur dioxide but by a lack of supplies of the raw material. When the C.I.L. spokesman was questioned about exports, he said:

> "one of the reasons for there being no exports in the years 1957 and 1958 ... is that there was not any liquid sulphur dioxide available for export; the entire production was taken up domestically.
>
> Q: "And the amount is limited by the operations of International Nickel?
>
> A: "Yes, sir."(1)

Thus a decrease in the availability of smelter gas or a decrease in the output of the plant because of other circumstances could give rise to a situation where domestic supplies would not be available but Canadian consumers would be forced to import their requirements and to pay the 20 p.c. duty, or instal equipment to use elemental sulphur.

The company's spokesman did not indicate what eventuality was anticipated that might make tariff protection necessary. His contention that the utilization of smelter gases for the manufacture of sulphur dioxide conferred benefits on the local community and the economy in general is undoubtedly true. However, the plant was established as a commercial operation with the cost of the raw material reflecting the disposal problem at the smelter.

The consumers of sulphur dioxide who made representations to the Board did so in general submissions. Their main concern was that higher rates of duty on chemicals would be reflected in their costs and would make them less able to compete in the domestic and export markets.

At the public hearing the question arose whether a solution of sulphur dioxide in water would be classified under heading 28.07 of the B.T.N. as an aqueous solution of the chemical or whether a chemical reaction was involved in dissolving sulphur dioxide in water with the formation of sulphurous acid which would be classified under heading 28.13. Subsequent to the public hearing the Industry Committee informed the Board that further investigations led it to accept the view that sulphurous acid is not an isolated chemical and is found only as its salts. This is also the position taken in the Explanatory Notes to the Brussels Nomenclature. Thus, sulphur dioxide in aqueous solution would be classified under heading 28.07.

(1) Transcript, Vol. 9, p. 1363

SULPHURIC ACID; OLEUM - B.T.N. 28.08

The Product and the Industry

Concentrated sulphuric acid is a dense, oily liquid that is miscible with water in all proportions. When pure it is colourless; when impure it is yellow or brown in colour. Mixing with water is hazardous because it is accompanied by the evolution of enough heat to cause explosive spattering.

The acid is very reactive. It dissolves most metals and oxidizes, dehydrates or sulphonates most organic compounds. The concentrated acid is very corrosive and will destroy clothing and cause severe burns on contact.

Sulphuric acid is available for sale in several concentrations to meet particular requirements. These vary from "battery acid" which is a 33.5 per cent concentration to the monohydrate which is 100 per cent pure acid.

Oleum, or fuming sulphuric acid, is sulphuric acid to which an excess of sulphur trioxide has been added. Oleums ordinarily contain from 20 to 80 per cent of sulphur trioxide and are either liquid or solid, varying in colour according to their purity. They react violently with water, give off dangerous fumes and attack skin and clothing.

Sulphur trioxide is classified under heading 28.13 of the B.T.N.; it is dealt with under that heading.

The chemical reactions which occur when sulphuric acid and oleum are manufactured were described as follows:

> "Sulphuric acid is produced from sulphur dioxide (SO_2) which, in the presence of a catalyst, is combined with additional oxygen (O) to produce sulphur trioxide (SO_3) which in turn combines with water (H_2O) to produce sulphuric acid (H_2SO_4). Since the reaction of SO_3 and H_2O generates great heat, it is customary to dissolve the sulphur trioxide in concentrated sulphuric acid, in which it dissolves quietly, and to adjust the strength later."(1)

Some sulphuric acid is reclaimed after having been used and may be used again or sold to others. However, this constitutes a very small part of Canadian supplies.

Sulphuric acid is priced according to the concentration of acid and its purity. Because dilute sulphuric acid is very corrosive to steel whereas the concentrated acid is not, commercial sales, which are usually in steel containers, are ordinarily of fairly concentrated acid. The concentration of the acid is expressed in terms of "degrees Baumé", a measure of specific gravity. The lowest concentration in tank car lots for which prices are regularly published in the U.S.A.,

(1) Transcript, Vol. 8, p. 1148

is 60° Bé., or 77.67 per cent of acid; the usual "concentrated acid" is 66° Bé. or 93.19 per cent of acid. Various concentrations, commonly available in North America, are listed below.

Typical Concentrations of Sulphuric Acid

Common Designation	Per Cent Acid	Degrees Baumé	Specific Gravity at 15.6° C.
Battery Acid	33.33	29	1.250
Fertilizer Acid or Chamber Acid	62.2	50	1.526
60° Bé. Acid, or Tower Acid, or Glover Acid	77.67	60	1.706
66° Bé. Acid, or Oil of Vitriol, or Concentrated Acid	93.19	66	1.835

Source: Faith, Keyes and Clark, Industrial Chemicals, p. 749

In addition to the above, sulphuric acid is also regularly sold in 98, 99, and 100 per cent concentrations, and in various strengths of oleum.

Oleum, which is a solution of sulphur trioxide in 100 per cent sulphuric acid, is sold as 10 per cent, 20 per cent, 25 per cent and 40 per cent oleum. Twenty per cent oleum is a solution containing 80 parts of 100 per cent sulphuric acid and 20 parts of sulphur trioxide. The 40 per cent oleum is rarely produced in North America, although in Europe even a 60 per cent oleum is readily available.[(1)]

As indicated earlier, sulphur dioxide is the chemical from which both sulphuric acid and oleum are produced. The sulphur dioxide may be obtained by burning elemental sulphur in air, by recovering the sulphur dioxide which is released when sulphide ores such as pyrite and pyrrhotite are heated, or by recovering it from the waste gases of oil refineries. In Canada, although sulphur dioxide is produced by all of these methods, it is usually not recovered as the gas. Under ordinary circumstances the process is allowed to go on to produce sulphur trioxide and then sulphuric acid.

Sulphur dioxide cannot be discharged into the atmosphere in appreciable amounts; its conversion to sulphuric acid facilitates its disposal. The ready availability of large quantities of pyrite and pyrrhotite may also lead to their use as raw materials. In 1961, about 40 per cent of Canadian sulphuric acid capacity was based on the use of elemental sulphur as a raw material and 60 per cent on waste gases from metallurgical operations involving pyrites, pyrrhotites, zinc concentrates, nickel concentrates and oil refinery wastes.

(1) Transcript, Vol. 8, p. 1146

Production of sulphuric acid in Canada began in 1867, at London, Ontario and since that time has increased steadily. In the late nineteen-fifties output and consumption rose very rapidly in response to the demand for it in uranium processing and reached 1.7 million tons in 1959. Production and use then declined as uranium production decreased. Output increased again in 1962 as other applications began to more than offset the decreased demand arising out of the contraction of uranium processing. In 1964, Canadian production of sulphuric acid and oleum totalled approximately two million tons, well above that in 1959 when uranium was a much more important factor in its consumption.

Production, Imports, Exports and Apparent Domestic Disappearance of Sulphuric Acid, Selected Years, 1954-64

	Production	Imports	Exports	Domestic Disapp.
		- thousand tons -		
1954	924	*	22	902
1957	1,290	1	30	1,261
1959	1,739	18	28	1,730
1961	1,614	7	39	1,582
1962	1,696	7	35	1,668
1963	1,903	6	37	1,871
1964	1,960	4	67	1,897

Source: D.B.S., various publications and Canadian Chemical Processing

In 1962 there were 21 plants operating in seven provinces. Only one small plant, in Nova Scotia, was in operation in the Atlantic provinces, but there was one or more plants in each of the other provinces. Productive capacity was largest in Ontario, 41 per cent of the total, followed by British Columbia and Quebec with 29 and 17 per cent of the total, respectively.

Geographic Distribution of Sulphuric Acid Plants and Productive Capacity, as at January 1, 1962

	Number of Plants	Estimated Capacity in '000 tons	Per Cent of Total Capacity
Atlantic Provinces	1	9	*
Quebec	6	351	17
Ontario	7	838	41
Prairie Provinces	4	265	13
British Columbia	3	594	29
Canada	21	2,057	100

Source: Transcript, Vol. 8, p. 1151, and Trade Publications

Canadian plants vary greatly in size, the smallest producing less than 10,000 tons of acid in a year and the largest having a capacity of about one-half million tons annually. The average size of all plants producing sulphuric acid in 1962 was 98,000 tons per year. The average productive capacity of merchant-producing plants was 86,000 tons per year. Canadian plants appear to be comparable in size with sulphuric acid plants in the U.S.A.

A large part of Canadian productive capacity was installed and is used mainly for captive use. Of the 21 plants in operation in 1962, eight were producing mainly for captive use. Captive plants accounted for 940,000 tons of productive capacity, 46 per cent of the total, but a larger portion of production. In 1961, no merchant-producing plant sold less than two thirds of its production, the average being 92 per cent of output; on the other hand, no captive plant shipped more than eleven per cent of its production and four of the eight captive plants reported no sales at all.

Production and Captive Use of Sulphuric Acid, Selected Years, 1953-64

Year	Production	Captive Use	
	'000 tons	'000 tons	% of production
1953	823	530	64.4
1955	950	622	65.5
1957	1,290	770	59.7
1959	1,739	856	49.2
1961	1,614	906	56.1
1962	1,696	906	53.4
1963	1,903	..	..
1964	1,960	..	..

Source: Derived from data published by the D.B.S.

In 1962 there were 13 plants owned by eight companies which were primarily merchant-producers. Their capacity was 1.1 million tons, 54 per cent of the Canadian total productive capacity. Three quarters of merchant capacity was in Ontario, and 19 per cent in Quebec. Ontario and Quebec accounted for 94 per cent of merchant capacity and for 92 per cent of shipments by merchant-producers.

The Market

At the public hearing, in September 1960, it was said that:

> "Sulphuric acid is perhaps the most important industrial chemical in terms of volume of production and variety of uses. Almost every manufacturing industry is dependent, in some degree, on processes or materials which utilize this chemical. In Canada, while the major outlets for sulphuric acid are in fertilizer production and uranium recovery, the material is also essential in the prosecution of a large number of industrial processes..."(1)

(1) Transcript, Vol. 8, p. 1153

Since the hearing the relative importance of uranium processing has declined sharply while the use of sulphuric acid by the fertilizer and chemicals industries has increased very substantially.

Total Canadian consumption in 1964 was 1.9 million tons with an estimated value of around $40 million. Canadian consumption has been increasing for many years; in the ten-year period, 1955-64, it more than doubled.

Because more than half of the sulphuric acid consumed in Canada is captively produced, the commercial market is much smaller than is indicated by total consumption. In 1962 there was a market in Canada for 765,000 tons of acid, about 45 per cent of the quantity consumed. This acid had a value of almost $14.4 million.

The Market for Sulphuric Acid in Canada
Selected Years, 1953-64

Year	Domestic Disappearance '000 tons	Market[a] in Canada '000 tons	Market[a] in Canada $'000	Commercial Sales as % of Disappearance
1953	775	244	5,901	31
1955	921	289	6,746	31
1957	1,261	491	10,790	39
1959	1,730	880	19,677	51
1961	1,582	678	12,983	43
1962	1,668	765	14,444	46
1963	1,871	..	..	..
1964	1,897	..	..	..

(a) Shipments plus imports less exports

Source: Derived from data published by the D.B.S.

The largest use of sulphuric acid in Canada is in the manufacture of fertilizers. In 1959, the last year for which continuous data are available, 688,000 tons were for this purpose, about 40 per cent of the total consumption in that year. Apart from the consumption by the uranium industry, about 60 per cent of the use of sulphuric acid in 1959 was in the production of fertilizers.

In 1956 large quantities of sulphuric acid began to be used to process uranium ore. In 1958, 587,000 tons were for this purpose and in 1959, 620,000 tons. By 1960, the declining demand for uranium was reflected in a decrease of 40 per cent in the demand for sulphuric acid; a further decrease of 24 per cent occurred in 1961. In 1961, only 283,000 tons were used for this purpose, less than half that of the peak year 1959.

The major uses of sulphuric acid take such large quantities that they tend to overshadow the lesser but still very substantial consumption of the chemical by a great many other industries. However, its uses are so pervasive that it is said to be the most im-

portant industrial chemical both from the standpoint of volume of production and variety of applications.

Consumption of Sulphuric Acid, by Selected Industry, 1961 and 1962

	1961	1962	1961	1962
	'000 tons		% of total	
Industrial Chemicals	833	885	52.7	53.1
Mixed Fertilizers	127	237	8.0	14.2
Plastics & Synthetic Resins	21	22	1.3	1.3
Soaps & Cleaning Compounds	16	18	1.0	1.1
Other Chemicals	11	11	0.7	0.7
Total Chemicals	1,008	1,173	63.7	70.3
Uranium Ore Processing	283	240	17.9	14.4
Iron and Steel	68	70	4.3	4.2
Other Mineral Processing	52	46	3.3	2.8
Pulp and Paper	36	43	2.3	2.6
Miscellaneous(a)	96	65	6.1	3.9
Petroleum Refining	14	13	0.9	0.8
Other Minor Uses	8	8	0.5	0.5
Unreported Uses	17	10	1.1	0.6
Total Disappearance	1,582	1,668	100.0	100.0

(a) Includes mainly synthetic textiles and explosives

Source: D.B.S., various publications

Until 1957, when the use of sulphuric acid for refining uranium ore changed the pattern drastically, British Columbia was the major consuming province. In British Columbia, the acid was used mainly in the production of fertilizers. Ontario followed in the amount of sulphuric acid used annually and Quebec was third. From 1957 to 1959 inclusive, as uranium ore refining increased, consumption in Ontario rose very sharply and since then this province has led the others in the amount consumed. Industrial chemicals account for a large part of the consumption in Central Canada.

Since 1954, consumption has risen rapidly in Alberta and Saskatchewan coincident with the increased use of the acid in the production of fertilizers and the refining of petroleum. Consumption has continued to be relatively very small in Manitoba and the Atlantic Provinces.

A very large part of the total use in Western Canada is captive. Most of the sulphuric acid produced west of Ontario is used by companies such as Consolidated Mining and Smelting and Northwest Nitro-Chemicals Company Limited in the production of fertilizer materials. As a result, the commercial market is concentrated largely in Ontario and Quebec with Ontario being by far the largest market

area in Canada. Ontario accounts for about 75 per cent of the total estimated sales in Canada. Quebec is the only other province in which estimated sales are more than 25,000 tons annually. Together, the two provinces accounted for 92 per cent of the estimated sales in Canada in 1962.

Consumption of Sulphuric Acid by Regions
Selected Years, 1952-62

Year	Atlantic Provinces	Quebec	Ontario	Prairie Provinces	British Columbia	Canada
			- thousand tons -			
1952	9	135	196	8	442	790
1955	9	164	220	25	520	938
1957	8	186	209	165	519	1,087
1959	8	259	770	203	529	1,769
1960	7	267	547	249	504	1,574
1961	8	308	491	266	493	1,565
1962	6	313	584	262	493	1,658

Source: D.B.S., Sulphuric Acid, Caustic Soda and Chlorine, Annual Reports

Estimated Market for Sulphuric Acid, by
Region, 1961 and 1962

	1961	1962	1961	1962
	'000 tons		% of total	
Atlantic Provinces	4	4	0.6	0.5
Quebec	119	122	18.1	16.2
Ontario	483	573	73.3	76.2
Prairies and B.C.	53	53	8.0	7.0
Canada	659	752	100.0	100.0

Source: Derived from various publications of the D.B.S.

Pricing Policy and Prices

Sulphuric acid is sold in tank cars, tank trucks, in carboys which contain about 175 pounds of acid and in winchester bottles. Sales other than in tank cars or tank trucks are a very small proportion of the total.(1) Bulk sales of sulphuric acid are on a freight-equalized basis, f.o.b. works.

Until 1964, the principal commercial area, Eastern Canada, was divided into two parts for pricing with Ontario comprising one

(1) Transcript, Vol. 8, p. 1152

area, and Quebec and the Atlantic provinces the other. Base prices were ordinarily higher in Quebec than in Ontario, although from June 1956 to April 1960 they were the same. From April 1960 until early in 1964 the base price in Ontario was $22.35 a ton and in Quebec and the Atlantic Provinces, $25.35 a ton. Since 1964, the base price has been the same throughout the region east of Manitoba, $22.35 a ton of 66° Baumé (93.19 per cent) acid.

Prices of Sulphuric Acid, f.o.b. Works, in Tank Cars or Tank Trucks, 66° Baumé, 1952-65

Effective Date	Ontario	Quebec
	$ per ton	
January 1952	20.00	21.50
June 1956	25.35	25.35
April 1960	24.00	25.35
December 1962	24.00	25.35
1963	22.35	25.35
1964	22.35	22.35
July 1965	22.35	22.35

Source: Transcript, Vol. 8, p. 1165-6 and Canadian Chemical Processing

Base prices in Ontario for the concentrated acid (66° Bé.) were the same as in the U.S.A. in 1952 (at parity of exchange) and were lower than those in the U.S.A. from 1952 until June 1956, by $2.35 a ton. In June 1956, Ontario base prices were raised by $5.35 a ton, or 27 per cent, and remained $3 a ton higher than in the U.S.A. until April 1960 when they were lowered to $24 a ton. Early in 1963 the Ontario base price was reduced by $1.65 a ton and until early in 1965 it was the same as in the U.S.A. In 1965 the price in the U.S.A. was increased by 90 cents a ton. In July 1965, the base price in Ontario and Quebec at the then current exchange rate, was $2.74 a ton less than in the U.S.A. The extent to which published base prices are observed is not known. However, the manufacturers' representative indicated that Canadian producers have "... several contracts with substantial individual users in Canada at prices below the list prices."(1)

(1) Transcript, Vol. 8, p. 1159

Comparison of Base Prices for Concentrated Sulphuric Acid, Per Ton, in Ontario and in the U.S.A. Selected Years 1952-65

Year	U.S.A. (a)		Ontario
	$ U.S.	$ Can.	$ Can.
1952	20.00	19.58	20.00
1955	22.35	22.04	20.00
1957	22.35	21.43	25.35
1959	22.35	21.43	25.35
1961	22.35	22.65	24.00
1962	22.35	23.89	24.00
1963	22.35	24.10	22.35
1964	22.35	24.11	22.35
1965 (July)	23.25	25.09	22.35

(a) Converted on basis of average, noon, spot rate of exchange

Source: Transcript, Vol. 8, p. 1165-6; Oil, Paint and Drug Reporter and Canadian Chemical Processing

Foreign Trade

Imports of sulphuric acid are not a large part of Canadian supplies; exports, although much larger than imports, have usually been about five per cent of sales by Canadian producers in recent years. However, in 1964 exports were approximately double their usual level and probably approached 10 per cent of sales by Canadian manufacturers.

Canada ordinarily exports much more sulphuric acid than it imports. In the ten years, 1955 to 1964, there was a net importation in only one year, 1958 -- when a strike at the plant of a major producer reduced production in Central Canada. Virtually all foreign trade is with the U.S.A.; entry into the U.S.A. is free of duty.

Exports and Imports of Sulphuric Acid, Selected Years, 1955-64

	Exports		Imports		Net Exports (a)	
	tons	$'000	tons	$'000	tons	$'000
1955	29,578	554	151	7	29,427	547
1957	29,549	548	1,046	35	28,503	513
1959	27,863	482	18,489	321	9,374	161
1961	38,914	637	7,275	128	31,639	509
1962	34,960	625	7,162	144	27,798	481
1963	37,316	651	5,634	119	31,682	532
1964	67,409	1,078	4,209	99	63,200	979

(a) Exports minus imports

Source: D.B.S., Trade of Canada, Imports and Trade of Canada, Exports, s.c. 8008, s.c. 40115

At the public hearing, a spokesman for some of the manufacturers of sulphuric acid stated that "Sales to a parent company in the United States (Cyanamid) account for most of this tonnage"(1) of exports. The Canadian plant of Cyanamid of Canada Limited is located near Niagara Falls, Ontario, and the parent plant to which reference was made is at Niagara Falls, New York. Since the hearing there has been some evidence of exports to the U.S.A. from British Columbia.

Imports into Canada have entered mainly into Ontario. Between 1957 and 1963 imports entered into Ontario were more than 90 per cent of the total in each year except 1960 when they were 84 per cent of the total.

Imports of Sulphuric Acid, by Region of Entry, Selected Years, 1957-63

Year	Region of Entry: East of Manitoba	Manitoba and West	Canada	Ontario as Per Cent of Total
		- tons -		
1957	978	68	1,046	93.2
1959	16,843	1,646	18,489	90.0
1961	7,241	33	7,275	98.1
1962	7,127	34	7,162	99.5
1963	5,580	54	5,634	98.9

Source: D.B.S., s.c. 8008

According to the submissions of the manufacturers, the location of producers relative to consumers is a factor of great significance in the competition for markets. Costs of transporting sulphuric acid are high relative to the value of the chemical and producers said that there were few locations in Canada at which acid from the U.S.A. could be purchased more economically than Canadian-produced acid, even if imports were free of duty.(2) The manufacturers' spokesman said:

> "if any substantial use developed which an existing acid producer wasn't prepared to supply, the user would put in the equipment and produce his own supply."(3)

The spokesman for the producers said that only a very few, small areas of Canada are exposed to competition from U.S. producers. Windsor, Ontario, was said to be one such area.

(1) Transcript, Vol. 8, p. 1154
(2) Same, Vol. 8, p. 1178-9
(3) Same, Vol. 8, p. 1178

Tariff Considerations

Sulphuric acid and oleum are entered under tariff items 217 and 217a.

		British Preferential Tariff	Most-Favoured-Nation Tariff
Item 217	Sulphuric...acid, n.o.p. ...per one hundred pounds	$17\frac{1}{2}$ cts.	$22\frac{1}{2}$ cts.
Item 217a	Sulphuric and muriatic acids, not including glass containers, when in packages weighing not more than 100 pounds...per one hundred pounds..................	Free	$22\frac{1}{2}$ cts.

Almost all imports are from the U.S.A. and are therefore subject to the M.F.N. rate of duty. Total imports in the ten years 1955-64, other than from the United States, were valued at only \$1,500. In recent years 55 per cent of the imports have been entered free of duty under end-use item 663b, for use in the manufacture of fertilizers.

Seven manufacturers of inorganic acids participated in a joint submission dealing with sulphuric, nitric and hydrochloric acids, and with anhydrous hydrogen chloride. Of these the following four companies were producers of sulphuric acid:

Allied Chemical Canada Limited
Canadian Industries Limited
Cyanamid of Canada Limited
Shawinigan Chemicals Limited

The manufacturers urged that sulphuric acid and oleum be classified in a tariff item like heading 28.08 of the Brussels Tariff Nomenclature and be subject to duties of 15 p.c., B.P. and 20 p.c., M.F.N.(1)

The Electric Reduction Company (Erco), a major consumer, supported the rates proposed by the manufacturers for sulphuric acid.(2)

Three manufacturers of soaps and detergents informed the Board that they did not oppose the rates proposed by the producers for sulphuric acid and oleum both of which they used in substantial amounts.(3) They were Canada Packers Limited, Lever Brothers Limited and Swift Canadian Company Limited.

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(1) Transcript, Vol. 8, p. 1138
(2) Same, Vol. 9, p. 1288
(3) Same, Vol. 13, p. 1900

The spokesman for Naugatuck Chemicals Division of Dominion Rubber Company Limited said he did not take issue with the rates recommended by the producers of sulphuric acid provided the Board would accept the recommendations of the company for the products which it manufactured.(1)

Consolidated Mining and Smelting Company Limited (Cominco), the largest producer of sulphuric acid in Canada opposed any increase in existing rates and the exclusion of oleum or sulphuric acid from end-use treatment under the existing Tariff.(2)

The Canadian Pulp and Paper Association also opposed any increase in the existing rates for sulphuric acid.(3)

The Canadian Federation of Agriculture expressed an interest in sulphuric acid as a material used in the manufacture of fertilizers. The Federation proposed free entry under all Tariffs for chemicals used in the manufacture of fertilizers.(4) They may be so entered at present under tariff item 791.

Polymer Corporation Limited expressed its interest in sulphuric acid and urged the continuation of the provisions of tariff item 851 for free entry for chemicals used in the manufacture of synthetic rubber.(5)

The Canadian Pharmaceutical Manufacturers Association also indicated an interest in sulphuric acid. It proposed rates of 15 p.c., B.P. and 20 p.c., M.F.N., for chemicals made in Canada, which are used in the manufacture of pharmaceuticals.(6)

No other representations were made relating specifically to sulphuric acid or oleum.

Thus, apart from end-use considerations, there were two proposals before the Board. The manufacturers, supported by Erco, Naugatuck and three soap producers, recommended rates of 15 p.c., B.P. and 20 p.c., M.F.N.; Cominco and the Pulp and Paper Association opposed any increase in the existing rates.

As noted earlier, imports are almost entirely from the U.S.A. and therefore are subject to the M.F.N. duty of 22½ cents per hundredweight, or $4.50 per ton, under both items 217 and 217a. The duty collected in the five latest years for which data are available, 1959-63, has averaged 20.4 per cent of the dutiable value of imports. Moreover, relative to the base price in the U.S.A. of $22.35 per ton the existing M.F.N. specific duty is equivalent to 20 p.c., ad valorem at parity exchange. Thus, the proposal of the manufacturers appears to involve no change in the existing effective rate of duty, apart from the very substantial duty-free importations under end-use items.

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(1) Transcript, Vol. 6, p. 902
(2) Same, Vol. 5, p. 715
(3) Same, Vol. 85, p. 13006
(4) Same, Vol. 83, p. 12813-4
(5) Same, Vol. 89, p. 13501
(6) Same, Vol. 87, p. 13321

The acid producers claimed that average costs of production are higher in Canada than in the U.S.A. Their spokesman conceded that the relatively high cost of transportation limited foreign competition but said that some areas in Canada were nearer producers in the U.S.A.; in these areas the existence of the Tariff was represented as an important factor in gaining sales for Canadian producers. The producers also said the existence of Canadian production facilities provided a means for up-grading Canadian raw materials and that the country benefited from such activities and the employment which resulted from them.

Cominco opposed any increase in duties on sulphuric acid and oleum mainly on the grounds that even with free entry the imported products would be competitive in only a very small part of Canada where consumption was small. The company was concerned by the possibility of retaliation by other countries and the impact of higher duties on costs of Canadian manufacturers.

The Pulp and Paper Association was mainly concerned with the effect of higher tariffs on costs of producing pulp and paper products. The industry spokesman referred to the highly competitive markets in which the products of this industry were sold and said higher tariffs would impair the ability of the industry to compete successfully in these markets.

In 1964 Canada consumed about 1.9 million tons of sulphuric acid and oleum of which about one half was probably captively-produced and one half was purchased by consumers. At the base price for sulphuric acid, in 1964, of $22.35 a ton f.o.b. works, the sales would have had a value of more than $40 million.

Total imports were 4,200 tons valued at approximately $100,000, a negligible part of Canadian use or sales in 1964 as in most other years; more than 99 per cent of Canadian use and purchases are of the Canadian-produced product.

Although exports are also a relatively unimportant feature of Canadian trade in sulphuric acid, they are ordinarily several times as large as imports. In 1964, a year of unusually large exports, their value was about $1 million, ten times the value of imports; in other recent years exports were about five times the value of imports.

Foreign trade is limited by the high cost of transportation relative to the value of the product. The spokesman for the Canadian producers cited the Windsor area of Ontario as the principal one where the Tariff was a factor in selling Canadian-produced sulphuric acid. Practically all foreign trade is with the U.S.A. and the Board was informed that most exports were by the Cyanamid plant near Niagara Falls, Ontario, to a plant of its parent company near Niagara Falls, New York. It was emphasized at the public hearing that if a substantial use developed at some distance from established suppliers, a plant would probably be built to supply this demand to avoid the high cost of freight.

Although the Canadian manufacturers claimed to have higher costs than plants in the U.S.A. this was not established. Many Canadian plants which produce sulphuric acid are large by any standards. Moreover, a large proportion of Canadian production is from metallur-

gical refining wastes and Canada has always had large supplies of these raw materials; Canada exports to the U.S.A. large quantities of pyrites, an important raw material for the manufacture of sulphuric acid.

The usefulness of a B.P. Tariff of 15 p.c. was not made clear. The producers said the proposed rate was "nominal" and that "it is not economically feasible to import these materials from any British country."(1) Imports from British preferential countries have been negligible. The need for an M.F.N. rate of 20 p.c. was also not clearly established. More than one half of recent imports have been entered under end-use item 663b and these would not be affected by the producers' proposal as long as the item remained. On the basis of recent imports it would appear that if all dutiable imports ceased, Canadian plants would gain an additional market for between five and ten thousand tons annually, an insignificant fraction of annual Canadian use.

(1) Transcript, Vol. 8, p. 1251

NITRIC ACID - B.T.N. 28.09

Nitric acid is a colourless or yellowish liquid which is very corrosive. It can be produced in a variety of ways but in Canada it was said to be manufactured only by the oxidation of ammonia in air in the presence of a catalyst.

In 1960, at the time of the public hearing, there were six companies which produced nitric acid in Canada in ten plants. By the end of 1960, a seventh company began production at Maitland, Ontario. Most of the plants produced nitric acid entirely or almost entirely for their own use. The Board was informed that only two companies sold nitric acid.

Distribution of Nitric Acid Capacity, by Province, 1962

Province	Estimated Annual Capacity, Basis 100% Acid	
	tons	% of total
Quebec[(a)]	34,000	7.7
Ontario	235,000	53.5
Alberta	102,000	23.2
British Columbia	68,000	15.5
	439,000	100.0

(a) Excludes Canadian Arsenals Limited at Valleyfield, Quebec

Source: Transcript, Vol. 8, p. 1193 and trade magazines

Canadian production of nitric acid was about 420,000 tons in 1962, of which 400,000 tons were used by the companies which produced it and 20,000 tons, only five per cent of the total, were sold. Most of the captive use is in the manufacture of fertilizers (about 75 per cent of the total output) and in the production of explosives and nylon intermediates.

At the public hearing some Canadian manufacturers estimated consumption in 1960 to be as in the following table. They estimated the commercial demand in that year to be for about 26,000 tons, of which 21,000 tons were for uranium oxide recovery. Since 1960 this use is known to have decreased sharply although no published data are available. The use of nitric acid for this purpose is likely to increase again in the next few years as the processing of uranium oxide increases in response to already announced governmental programmes and a rising demand for the product. The commercial market, exclusive of uranium mines, was for 5,000 tons in 1960, about one per cent of the output.

Estimated Consumption of Nitric Acid, by Industry, 1960

Use	Tons of 100% Acid	% of Total
Fertilizers	274,000	72.8
Explosives	42,000	11.2
Nylon Intermediates	36,000	9.6
Uranium Oxide Recovery	21,000	5.6
Metal Processing	1,000	0.3
Pigments and Dyes	500	0.1
Photo-engraving	200	*
Paper	100	*
Miscellaneous	1,300	0.4
	376,100	100.0

Source: Transcript, Vol. 8, p. 1194

Imports of nitric acid are negligible; they averaged about 100 tons, valued at $20,000 annually, in the five years 1959-63. All imports have been from the U.S.A. The uranium mines, the principal users of purchased nitric acid, are located in the Blind River area of Ontario, about 200 miles from the nearest Canadian supplier at Nobel, Ontario. The nearest potential supplier in the U.S.A. is at Buffalo, New York, about 450 miles from the Blind River area. There are no known exports of nitric acid.

Imports of Nitric Acid, Selected Years, 1953-63

Year	tons	$'000	$ per ton
1953	149	19.3	130
1955	244	27.0	110
1957	160	17.7	110
1958	2,405	185.3	78
1959	107	18.5	172
1960	126	20.6	164
1961	98	20.9	212
1962	91	25.5	280
1963	89	14.5	162

Source: D.B.S., Trade of Canada, Imports, s.c. 8005

The 80 per cent of nitric acid sales to uranium companies have been on a delivered price basis; the remaining sales are f.o.b. producing plant, freight equalized. Canadian prices are not published, but in the U.S.A. for sales in bulk they are quoted for 100 per cent acid, varying in actual concentration from 58.5 per cent to 68 per cent of nitric acid or about 39° to 42° Bé.

In 1960, the Canadian price was said to be $50.40 per ton, delivered to uranium companies. The price to other bulk purchasers was said to be $59 a ton, f.o.b. works, freight equalized; the

comparable price in the Eastern U.S.A. was $U.S. 53 a ton.[1] The price in the U.S.A. was unchanged in mid-1965.

The acid is ordinarily shipped in stainless steel tank cars or tank trucks in concentrations of around 60 to 70 per cent of acid in water solution. Small quantities are also sold in drums, carboys or winchester bottles.[2]

Tariff Considerations

Nitric acid, in bulk, commercial and chemically pure grades, is entered under tariff item 711 at rates of 15 p.c., B.P. and 20 p.c., M.F.N. In packages weighing not more than 100 pounds, not including glass containers, it is entered under item 216c at rates of Free, B.P. and 20 p.c., M.F.N. It might be entered duty-free under tariff item 663b as a material for use in the manufacture of fertilizers. Apart from the application of these tariff items, nitric acid is entered under tariff item 216 at rates of Free, B.P., 15 p.c., M.F.N. All imports have been from the U.S.A. so that the effective rate of duty under tariff items 216c and 711 would be the M.F.N. rate of 20 p.c.

At the public hearing in September 1960, three producers of nitric acid, Canadian Industries Limited, Cyanamid of Canada Limited and Du Pont of Canada Limited, presented a joint submission in which they urged that nitric acid, as described by heading 28.09 of the Brussels Tariff Nomenclature, be dutiable at rates of 15 p.c., B.P. and 20 p.c., M.F.N.[3]

This proposal was supported by Electric Reduction Company of Canada, a consumer of the acid at its plant at Buckingham, Quebec.[4]

Consolidated Mining and Smelting Company of Canada Limited expressed its interest as a producer of nitric acid. The company opposed any increase in rates of duty for chemicals used by Canadian manufacturers.[5]

The Canadian Pharmaceutical Manufacturers Association expressed an interest in the acid as one of the less important chemicals used by its members. It recommended rates of 15 p.c., B.P. and 20 p.c., M.F.N. for chemicals made in Canada and used in the manufacture of pharmaceuticals.[6]

As noted previously, all imports of nitric acid have been from the U.S.A. Apart from end-use provisions of the Customs Tariff, these imports would be dutiable at 20 p.c., the M.F.N. rate under both items 216c and 711.

(1) Transcript, Vol. 8, p. 1193
(2) Same, Vol. 8, p. 1194
(3) Same, Vol. 8, p. 1138
(4) Same, Vol. 9, p. 1293-4
(5) Same, Vol. 5, p. 715
(6) Same, Vol. 87, p. 13321

The acid manufacturers supported their proposal in a general submission dealing with the major inorganic acids. In their submission they made reference to higher costs of producing acids in Canada, the smallness of the Canadian market and consequent disadvantages of smaller scale production, higher costs in Canada of equipment and other related matters. Most of the arguments presented would be difficult to apply to the circumstances relevant to nitric acid production.

The principal raw material in the manufacture of the acid is ammonia, which is produced principally in large-scale plants. Canada appears to be competitive with other countries, including the U.S.A., in the manufacture of ammonia (see discussion under heading 28.16). Canadian output of nitric acid currently exceeds 400,000 tons annually of which about 95 per cent is for captive use. The principal use of the acid is in the manufacture of fertilizers which Canada exports in very large quantities.

Relative to production, sales of nitric acid are small, about 25,000 tons annually, or approximately five per cent of the total. Most sales have been to uranium producers and it appears that Canadian plants are more advantageously located to serve these purchasers than are potential competitors in the U.S.A. Imports of nitric acid, currently about 90 tons annually, are negligible.

SULPHONITRIC ACIDS - B.T.N. 28.09

Sulphonitric acids are mixtures of concentrated sulphuric and nitric acids which are produced according to the specifications of the customer. They are highly corrosive, viscous liquids which are used in the production of synthetic dyestuffs, nitrocellulose and explosives. In North America they are known as "mixed acids"; in Europe the term "sulphonitric acid" is commonly used.

Sulphonitric acids are purchased by relatively few users and prices are negotiated.(1) The total market in Canada was estimated to be a "few hundred tons" annually and the representative of the manufacturers stated that to his knowledge there were no exports or imports of the acids.

Sulphonitric acids are entered under tariff item 220a(i) as "chemical preparations, compounded of more than one substance, n.o.p." at rates of 15 p.c., B.P. and 20 p.c., M.F.N.

The manufacturers of acids who made a joint submission on some of the major acids proposed that sulphonitric acids should continue to be dutiable at the existing rates.(2)

Electric Reduction Company of Canada supported the rates proposed by the manufacturers.(3)

(1) Transcript, Vol. 8, p. 1231
(2) Same, Vol. 8, p. 1138
(3) Same, Vol. 9, p. 1293-4

Naugatuck Chemicals Division of Dominion Rubber Limited also supported rates of 15 p.c., B.P. and 20 p.c., M.F.N. However, their support was conditional on the Board recommending those rates which the company would propose for the products which it manufactures.(1)

Consolidated Mining and Smelting Company of Canada Limited, (Cominco), opposed any increase in rates for chemicals used by Canadian manufacturers.(2) Cominco expressed an interest in sulphonitric acids, as a producer.

The Canadian producers who proposed retention of the existing rates supported their proposal in a general submission. Although they advanced various arguments in support of the rates they proposed, it is not known which of these were thought to relate specifically to sulphonitric acids.

From the information given to the Board, it would appear that these mixed acids are of little commercial significance in Canada. According to a spokesman for the manufacturers, there are no known imports or exports.

(1) Transcript, Vol. 6, p. 900
(2) Same, Vol. 5, p. 715

PHOSPHORUS PENTOXIDE AND PHOSPHORIC ACIDS - B.T.N. 28.10

The Product and the Industry

Phosphorus pentoxide is a very corrosive, white powder which absorbs water avidly and must be transported in airtight containers. It is used for drying gases and in organic syntheses. Phosphorus pentoxide is the anhydride of phosphoric acid; it combines with water to form the acid.

Phosphoric acid, phosphorus pentoxide in water solution, occurs in three forms, meta-, pyro-, and ortho-phosphoric acid. The ortho- is common phosphoric acid. Phosphoric acid is very corrosive and dangerous to handle. It is difficult to preserve in the solid state as the anhydride, phosphorus pentoxide, and is usually put up and sold as an aqueous solution.

In Canada phosphoric acid is produced by two methods, "wet process" and "electro-thermal". The "wet process" involves the action of sulphuric acid on phosphate rock and the resulting acid contains many of the impurities of the rock which is used. In the "electro-thermal" process elemental phosphorus, produced from phosphate rock, is the starting raw material; the resulting acid is of a higher purity and usually of a higher concentration. Although "wet-process" acid can be concentrated and purified, the processing is costly and electro-thermal acid is usually used where concentrations exceeding 75 per cent acid, or relatively high purity, are required.(1)

Wet-process phosphoric acid and the phosphatic fertilizers which are produced from it provide a market for large quantities of elemental sulphur and sulphur contained in pyrites, pyrrhotite, waste smelter gases and oil refinery wastes. The sulphur in these materials is converted into sulphuric acid which is used to convert phosphate rock into wet-process acid and phosphatic fertilizers, often in continuous reactions. The end products are fertilizer materials such as single and triple superphosphate and ammonium phosphate.

Wet-process acid is used almost entirely in the production of phosphatic fertilizer materials. Fertilizer manufacturers ordinarily produce their own acid and use their total output captively. The only producer of electro-thermal acid in Canada is Electric Reduction Company of Canada Limited (Erco), a wholly-owned subsidiary of an English Company. Erco produces electro-thermal phosphoric acid at Buckingham, Quebec, using elemental phosphorus which is manufactured in the company's plant at Varennes, Quebec. The production of phosphorus is discussed under B.T.N. heading 28.04.

Phosphorus pentoxide, the anhydride of phosphoric acid, was produced in Canada at one time, but the market shrank from several thousand pounds per annum to only 680 pounds in 1959. Supplies of the anhydride are imported from the U.S.A. and are distributed in Canada by the Electric Reduction Company, the former producer.(2)

(1) Transcript, Vol. 9, p. 1308
(2) Same, Vol. 9, p. 1296, 1313

At the time of the public hearing on phosphoric acid, in September 1960, wet-process phosphoric acid was produced only in Alberta and British Columbia, by two companies, Consolidated Mining and Smelting Company of Canada Limited (Cominco) and Northwest Nitro-Chemicals Limited, in three plants. In 1962, Erco began large-scale production of wet-process acid at Port Maitland, Ontario. Since 1962, plans have been reported for the expansion of existing plants and the establishment of new ones, in British Columbia, Alberta, Manitoba, Ontario, Quebec and New Brunswick. When these plans materialize, in 1966 or 1967, Canadian productive capacity for wet-process phosphoric acid will be three times or more of the estimated capacity in 1964 of around 400,000 tons per year.

The available information suggests that Canadian output of electro-thermal acid is currently around 40,000 tons per year. At the public hearing the spokesman for Erco said his company used more than 90 per cent of its output captively, mainly in the production of inorganic salts of sodium and calcium; the remainder is sold as acid.

The Market

It is estimated that in 1964 Canada consumed about 400,000 tons of phosphoric acid of which around 370,000 tons was wet-process and approximately 40,000 tons was electro-thermal acid. Exports of fertilizer contained the equivalent of about 100,000 tons of the wet process acid. Almost all of the production is used captively; sales are probably around 10,000 tons annually valued at nearly $2 million. The information submitted at the public hearing suggests that the commercial market for electro-thermal phosphoric acid in Canada has been less than 4,000 tons annually.(1)

The greater purity and the higher concentration of electro-thermal acid make it suitable for applications in which wet-process acid cannot normally be used.(2) These include sugar refining, acidification of bottled drinks, rust-proofing of metals (bonderizing) and others. The spokesman for Erco stated that there was some overlap in uses between electro-thermal and wet-process acids, but suggested that there was not much scope for substitution of one for the other.(3) Almost all of the wet-process acid is used for the manufacture of fertilizers.

Imports of phosphoric acid are ordinarily very small and all are from the U.S.A. In 1963, an unusually large quantity of phosphoric acid was imported most of it free of duty. Wet-process acid, imported for use in the manufacture of fertilizers, is entered free of duty and the available information indicates that the substantial imports of duty-free acid in 1963 were entered into Alberta to supply the temporary requirements of a manufacturer of fertilizers.

Imports of dutiable acid, presumably of electro-thermal acid, or equivalent quality, have been negligible in recent years. In the latest four years for which data are available they averaged 58.5 tons valued at about $12,000 annually.

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(1) Transcript, Vol. 9, p. 1296, 1309
(2) Same, Vol. 9, p. 1302-3
(3) Same, Vol. 9, p. 1303-4

Imports of Phosphoric Acid, Selected Years, 1950-63

	Total Imports		Dutiable Imports		Duty-Free Imports	
	tons	$'000	tons	$'000	tons	$'000
1950	300	35.2	300	35.2	-	-
1955	222	45.3	188	40.7	34	4.6
1958	212	25.2	155	21.3	57	3.9
1959	44	8.2	39	6.1	5	2.1
1960	38	7.7	38	7.7	*	-
1961	1,178	112.5	88	16.9	1,090	95.6
1962	374	41.2	43	8.8	331	32.4
1963	23,043	1,252.7	65	14.4	22,978	1,238.3

Source: D.B.S., Trade of Canada, Imports, s.c. 8006

Most imports of phosphoric acid are entered in Alberta and British Columbia; imports into provinces east of Alberta averaged 49 tons annually in the four years 1960-63; in three of the four years they were less than 20 tons. As noted above, the relatively large Canadian imports in 1961 and more particularly in 1963, were of duty-free acid almost all of which was entered into Alberta, apparently for the manufacture of fertilizers.

Imports of Phosphoric Acid, by Province of Entry, 1962 and 1963

	1962			1963		
	Free	Dutiable	Total	Free	Dutiable	Total
		tons			tons	
Nfld.	-	0.7	0.7	-	0.1	0.1
Quebec	5.0	1.4	6.3	0.2	4.9	5.1
Ontario	2.4	10.8	13.2	1.6	10.6	12.2
Alberta	324.0	-	324.0	22,975.5	..	22,975.5
B.C.	-	29.7	29.7	-	49.6	49.6
Canada	331.4	42.6	373.9	22,977.3	65.4	23,042.6

Source: D.B.S., s.c. 8006

Between 1950 and 1962, duty-free imports were generally negligible and in no year even approached one per cent of total Canadian consumption of wet-process acid. Imports of dutiable acid have also been small and have been declining since the early 1950's. At the beginning of the 1950's imports were about 300 tons annually; in the four years, 1960-63, they have been less than 100 tons in each year.

Imports of Phosphoric Acid, by Region of Entry, 1957 - 63

	Quebec	Ontario	Alberta	British Columbia	Canada[a]
			- tons -		
1957	3	29	49	66	147
1958	12	61	78	60	212
1959	2	3	4	35	44
1960	2	16	-	20	38
1961	3	140	1,007	28	1,178
1962	6	13	324	30	374
1963	5	12	22,976	50	23,043

(a) Small quantities imported into the Atlantic Provinces, mainly Newfoundland, are not shown separately, but are included in the total

Source: D.B.S., s.c. 8006

Ordinarily there are no exports of phosphoric acid. The spokesman for Erco, speaking of electro-thermal acid, stated that "this is partly due to the cost of manufacture in Canada and partly due to the cost of packaging and the type of packaging." He also indicated that his company had had "disastrous claims due to leakage" of acid in transit, and that the only container they deemed suitable for export was of stainless steel and cost $110 relative to a cost of $56 for the contents.(1) However, Canadian exports of phosphatic fertilizer materials represent the equivalent of more than 100,000 tons of wet-process acid annually. These exports are increasing and, in 1964, represented almost 30 per cent of Canadian production of wet-process acid.

Electro-thermal phosphoric acid is priced in Canada, f.o.b. plant, freight equalized. Because the Electric Reduction Company is the only merchant-producer in Canada, freight equalization is practised only against producers in the U.S.A. The company representative stated that in the Montreal area equalization is against Cartaret, New Jersey; in southwestern Ontario it is against Trenton, Michigan (near Detroit), and in the Prairie Provinces against tank truck shipments from Chicago, Illinois. In Vancouver the competition arises from plants in California.(2)

Canadian-produced electro-thermal phosphoric acid, at parity of exchange, was 26 per cent higher in published price than the comparable product in the U.S.A., from at least 1961 until 1964; in 1964 the published Canadian price increased to $7.70 per 100 pounds, 28 per cent higher than in the U.S.A. In terms of Canadian currency, the differences were smaller, ranging from 17 per cent in 1963 to 24 per cent in 1961.

(1) Transcript, Vol. 9, p. 1306
(2) Same, Vol. 9, p. 1299-1300

Prices of Phosphoric Acid, Food Grade, 80 per cent, in Tank Cars, f.o.b. Producer, 1961 - 64

	Canada	U.S.A.	(a)
	$ per cwt.	$U.S. per cwt.	$Can. per cwt.
1961	7.55	6.00	6.08
1962	7.55	6.00	6.41
1963	7.55	6.00	6.47
1964	7.70	6.00	6.47

(a) Converted on basis of average, noon, spot rate of exchange

Source: Canadian Chemical Processing; Oil, Paint and Drug Reporter

Prices of wet-process acid are not published in Canada. They would apply to acid of lower concentrations, containing more impurities and would be lower than for comparable concentrations of electro-thermal acid.

Tariff Considerations

Phosphorus pentoxide, the anhydride of phosphoric acid, is entered under tariff item 208p; phosphoric acid, including meta-, pyro- and orthophosphoric acid, is entered under item 216b.

	British Preferential Tariff	Most-Favoured-Nation Tariff
Item 208p		
Phosphorus and compounds thereof, n.o.p.	Free	20 p.c.
Item 216b		
Phosphoric acid........................	Free	25 p.c.

All known imports of both products are from the U.S.A. Thus, apart from end-use provisions of the Customs Tariff, the effective rates of duty, under the existing Tariff, are 20 p.c. for the anhydride and 25 p.c. for the acid. However, as noted earlier, most imports in recent years have been free of duty, apparently under tariff item 663b, as a material for use in the manufacture of fertilizers.

At the public hearing, in September 1960, the Electric Reduction Company of Canada proposed that both products be classified in an item worded like heading 28.10 of the Brussels Tariff Nomenclature, "phosphorus pentoxide and phosphoric acids (meta-, ortho- and pyro-). The rates proposed were Free, B.P. and 20 p.c., M.F.N.[1]

(1) Transcript, Vol. 9, p. 1295

Consolidated Mining and Smelting Company of Canada Limited, (Cominco), opposed any increase in the existing rates for chemicals used by Canadian manufacturers.(1) The company expressed an interest in phosphoric acid as a producer.

The Canadian Federation of Agriculture expressed an interest in phosphoric acid as a constituent of fertilizers. The Federation urged that chemicals used in the manufacture of fertilizers should continue to be entered free of duty under all Tariffs.(2)

The Canadian Pharmaceutical Manufacturers Association informed the Board that phosphoric acid was one of the more important chemicals used by its members. The Association recommended that chemicals made in Canada and used in the manufacture of pharmaceuticals should be dutiable at 15 p.c., B.P. and 20 p.c., M.F.N.(3)

The fact that phosphorus pentoxide is the anhydride of phosphoric acid and becomes the acid when water is added was advanced by Erco in support of its request for uniform rates for the two products. The company spokesman also said that the reason for requesting that the M.F.N. rate for phosphoric acid be reduced from 25 p.c. to 20 p.c. was that this would make the rate for the acid consistent with that proposed for phosphorus, the principal raw material used in its production.

The company spokesman contended that Erco was at a disadvantage relative to producers in the U.S.A. in producing phosphorus and that this cost disadvantage was carried over into phosphoric acid. He also said that productive capacity for the acid was being rapidly increased in the U.S.A. and that industry experts expected that capacity would outpace the anticipated consumption in the next few years. He said, "The obvious outlet for such a surplus is Canada ..."(4)

About 95 per cent of the phosphorus that is produced by Erco is used by the company to produce electro-thermal phosphoric acid and well over 90 per cent of this phosphoric acid is used by it to produce a variety of phosphates. Both phosphorus and phosphoric acid are of minor significance as products for sale, relative to their importance to the company as materials for further processing. The company's prime concern was that phosphoric acid might be imported to produce phosphates, thus affecting its position as a seller of phosphates, which account for about 95 per cent of the production of the acid.

The company spokesman said that scale was unimportant as a factor affecting costs of producing the acid and claimed that Erco's production of phosphoric acid was efficient and economical.(5) Except for the claimed cost disadvantages in producing phosphorus, the company advanced no other reasons for recommending an effective rate of 20 p.c. for both the anhydride and the acid.

Erco's competitive position as a manufacturer of phosphorus is discussed under B.T.N. heading 28.04; phosphorus constitutes about one quarter of the weight of 85 per cent acid and a much larger proportion of the cost of its production.

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(1) Transcript, Vol. 5, p. 715
(2) Same, Vol. 83, p. 12813
(3) Same, Vol. 87, p. 13321
(4) Same, Vol. 9, p. 1298
(5) Same, Vol. 9, p. 1296, 1304

The Canadian manufacturer, Erco, supplies almost all of the Canadian demand for electro-thermal acid. Imports of this acid were substantially less than 100 tons in the four latest years, 1960-63, compared with a total estimated use in Canada (mainly by Erco) of around 40,000 tons annually and commercial sales of the order of 3,000 to 4,000 tons annually. Most imports of high-purity acid have been into British Columbia; imports entered east of British Columbia were less than 20 tons in 1962 and 1963. The company has been able to retain virtually all of the Canadian market in spite of prices which apparently are 17 to 24 per cent higher than published prices in the U.S.A., expressed in terms of the Canadian dollar.

The total size of the market in British Columbia is not known, but it is probable that imported supplies are a substantial proportion of the commercial sales in this area. For sales in British Columbia the plant at Buckingham, Quebec, would have to compete with California suppliers who have the advantage of much lower freight costs. For all grades for which published prices are available for comparison, base prices, f.o.b. works in the U.S.A., are substantially lower than in Canada. The combined effect of lower U.S. base prices and freight costs would require the Canadian producer to accept a substantially lower return from sales in British Columbia, in order to compete with imported phosphoric acid in this market area.

Although Erco's concern was related to electro-thermal acid, its proposal would apply to wet-process acid. The available evidence indicates that wet-process acid, as such, is not important as an article of commerce. It enters, in very large volume, into both domestic and export sales of ammonium phosphates, superphosphates and mixed fertilizers. As indicated earlier, total sales of phosphoric acid in 1964 in such forms, by Canadian manufacturers were equivalent to almost 370,000 tons of 100 per cent phosphoric acid; of this amount, 103,000 tons were exported, mainly to the U.S.A.

It is noteworthy that after the hearing in 1960 Erco began production of wet-process acid and phosphatic fertilizers, at Port Maitland, Ontario. At later hearings, in 1962, the company informed the Board that it was exporting to the U.S.A. substantial quantities of phosphatic fertilizer materials which it produced at Port Maitland.

ARSENIC TRIOXIDE - B.T.N. 28.11

At the public hearing in November 1960, the spokesman for the Industry Committee said:

> "Of the three inorganic chemicals which could be classified by this heading, only the two shown in notice R-110 [arsenic acid, arsenic trioxide] were reported to the Committee as being significant to Canadian manufacturers of chemicals... but the reporting company has now sent the Board a letter stating that it is no longer manufacturing the product."(1)

No other submissions were made to the Board at this hearing relating to chemicals of heading 28.11. However, at the hearing in September 1962, dealing with tariff items 208, 219a and 791, Cobalt Refinery Limited presented a brief on arsenic trioxide.

In 1961, Cobalt Refinery Limited succeeded Deloro Smelting and Refining Company Limited as the only Canadian producer of arsenic trioxide. The company processes silver ore concentrates at its plant at Cobalt, Ontario on a custom smelting basis and recovers as by-products cobalt oxide, mixed cobalt and nickel oxide, copper, bismuth, lead, arsenic trioxide and very small quantities of gold. The residual material from which the by-products are extracted contains about 25 per cent arsenic. Because the arsenic makes this residue extremely poisonous it would have to be disposed of in relatively expensive ways if it were not processed to recover the arsenic trioxide and other by-products. Statements made at the public hearing indicated that it was more economic for Cobalt Refinery to process the residue than to dispose of it in other ways.(2)

In a brief presented by the company to the Minister of Mines of the Province of Ontario, dated November 19, 1962, the company said, "It is because of our recovery of the by-products that we can in a relatively small local operation offer to treat these ores [silver concentrates]".

In the company's submission to the Board, Canadian consumption was estimated to be about 400 tons annually. The Cobalt Refinery spokesman said that the company could supply the total Canadian demand from its operations.

The company informed the Board that two-thirds of the trioxide is consumed in Canada for the production of sodium arsenite, a herbicide; about 25 per cent is used in lead smelting; and the remainder is for miscellaneous purposes such as in glass, pharmaceuticals and chemicals.

Tariff Considerations

Arsenic trioxide is enumerated in item 208 (arsenious oxide). It may also be entered under end-use item 791. Under both items it would be entered free of duty under the B.P. and M.F.N. Tariffs.

(1) Transcript, Vol. 10, p. 1380
(2) Same, Vol. 85, p. 12953

Cobalt Refinery, in a letter dated September 24, 1962, proposed rates of 15 p.c., B.P. and 25 p.c., M.F.N., for arsenic trioxide. This letter changed an earlier proposal at the public hearing on September 10, 1962.

Two consumers of arsenic trioxide, Niagara Brand Chemicals and Chipman Chemicals Limited supported conditionally the rate proposals of Cobalt Refinery. In a telegram to the Board, Niagara Brand Chemicals stated:

> "Provided quality and quantity meets all Canadian demands and provided sodium arsenite has compensating Tariff protection we have no objection to duty on arsenate trioxide."(1).

Chipman Chemicals' support was also conditional on "compensating duty protection" on the sodium arsenite.

At the public hearing in November 1962, Cobalt Refinery Limited indicated that it intended its proposals to apply to arsenic trioxide as classified in tariff item 208 and the end-use items which now apply.(2) The effect of the proposal would be to exclude arsenic trioxide from end-use item 791 and to increase the rates for the product from the existing free entry under tariff items 208 and 791 to 15 p.c., B.P. and 25 p.c., M.F.N. All arsenic trioxide imported in the past ten years has been entered free of duty.

The Canadian Federation of Agriculture and the National Farmers Union strongly opposed any changes in end-use items related to products used by agriculture. This interest would apply to arsenic trioxide entered under item 791.

A group of seven Canadian pesticides manufacturers expressed an interest in arsenic trioxide and urged that when it is imported for use in the manufacture of pesticides, arsenic trioxide should be entered free of duty under both the B.P. and M.F.N. Tariffs.(3)

No other representations were made to the Board relating specifically to arsenic trioxide.

The principal argument advanced by Cobalt Refinery in support of its rate proposals was that foreign competition was forcing the company to accept a return on its arsenic trioxide that was less than its cost of production. The company claimed that imports from France and Belgium were being delivered at Montreal at ¾¢ to one cent per pound below the company's cost.

It would be very difficult to establish the costs of producing arsenic trioxide. The company spokesman indicated that the arsenic was an inevitable by-product of its refining of silver and that the extraction of silver from concentrates was the principal business of the refinery. He also stated that alternative methods of disposing of the arsenic would be more costly than processing the residue of silver extraction. Thus, the cost of processing the arsenic so that it can be disposed of might well be regarded as part of the cost of processing the silver concentrates.

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(1) Transcript, Vol. 85, p. 12959
(2) Same, Vol. 109, p. 16543
(3) Same, Vol. 108, p. 16332

It should be noted that the support of Niagara Brand Chemicals and Chipman was conditional on the quantity and quality of Cobalt Refinery's output and also on the condition of receiving compensating tariff protection for sodium arsenite.

OTHER PRODUCTS OF HEADING 28.11

The only other product of economic significance classified by heading 28.11 of the Brussels Tariff Nomenclature was said to be arsenic acid (ortho-arsenic acid). In a letter dated September 10, 1962, Niagara Brand Chemicals notified the Board that:

> "Arsenic trioxide is used in the manufacture of arsenic acid, which we import to manufacture lead and calcium arsenate at our Burlington plant.
>
> "The manufacture of arsenic acid in contrast to sodium arsenite involves a manufacturing process requiring a relatively high capital outlay. Since the volume of arsenic acid used in Canada is only of the order of 200 tons annually, the fact that arsenic trioxide was available in this country would not in any way influence us to manufacture arsenic acid, since this volume is far short of that needed to operate an arsenic acid plant economically.
>
> "Therefore, in supporting Cobalt Refinery, Limited's brief we restrict the support to the use of arsenic trioxide for the manufacture of sodium arsenite, only."

Arsenic acid is entered under tariff item 216, as an acid, n.o.p., of a kind not produced in Canada, at rates of Free, B.P. and 15 p.c., M.F.N., and under end-use item 791, free of duty under both the B.P. and M.F.N. Tariffs. Imports have been increasing recently and in 1963 were 664,000 pounds valued at $24,000. Almost all imports are from the U.S.A. and in the past ten years all have been entered free of duty, presumably under tariff item 791.

The letter from Niagara Brand Chemicals would appear to support retention of the existing end-use treatment. In a brief submitted by a group of seven companies which formulate pesticides it was recommended that chemicals which were not produced in Canada and which are now entered under item 791 should be free of duty under both the B.P. and M.F.N. Tariffs.(1) Niagara Brand Chemicals was one of the companies associated with this recommendation.

The only other product named in B.T.N. heading 28.11 is arsenic pentoxide. No representations were made at the hearing specifically on this product; by the Committee's general recommendation it would become dutiable at rates of 15 p.c., B.P., 20 p.c., M.F.N., the rates proposed by the Committee as the residual provision for heading 28.11.

(1) Transcript, Vol. 108, p. 16329

BORIC OXIDE AND BORIC ACID - B.T.N. 28.12

BORIC ACID

Boric acid (boracic acid, orthoboric acid) is produced by treating natural borates, such as borax, with hydrochloric or sulphuric acid, or by the physico-chemical treatment of crude boric acid. Crude boric acid occurs as the mineral sassolite in Italy and California. Very large deposits of borax occur in California (Death Valley), Bolivia, Chile and Peru.

Boric acid is not produced in Canada and all supplies are imported from the U.S.A. In 1964, imports were 1,638 tons valued at $224,000, approximately $137 a ton.

Imports of Boric Acid in Packages of Not Less than 25 Pounds, Selected Years, 1953-64

	tons	$'000	$ per ton
1953	1,902	198	104
1956	1,862	250	134
1959	2,259	248	110
1962	2,663	351	132
1963	1,514	197	130
1964	1,638	224	137

Source: D.B.S., Trade of Canada, Imports, s.c. 8001

Boric acid is used for a large variety of purposes including the manufacture of ethylene glycol-base antifreeze, ceramic glazes, refining of metals, preparation of leathers, production of water glass, pharmaceuticals, cosmetics and many others. There is little information available regarding the use of the product in Canada. Union Carbide Canada Limited informed the Board that it used about 300,000 pounds annually in the manufacture of ethylene glycol antifreeze, and about 100,000 pounds annually is consumed by pharmaceutical manufacturers. No other published data are available regarding boric acid and the above known uses account for only about ten per cent of the imports.

Tariff Considerations

Boric acid is enumerated in tariff item 208, "boracic acid", and is entered free of duty under both the B.P. and M.F.N. Tariffs. Item 208 pertains to "packages of not less than twenty-five pounds weight". When it is imported in smaller packages it is entered as an acid not made in Canada, under item 216, at rates of Free, B.P. and 15 p.c., M.F.N.

At the public hearing in November 1960, Union Carbide Canada Limited proposed that boric acid be entered free of duty under the B.P. and M.F.N. Tariffs while it is not made in Canada. When it is made in Canada the company supported rates of 15 p.c., B.P. and 20 p.c., M.F.N.(1)

The Canadian Pharmaceutical Manufacturers Association listed boric acid as a relatively minor chemical used by its members. It requested rates of Free, B.P. and 15 p.c., M.F.N., unless otherwise provided for, to apply to chemicals not made in Canada and used in the manufacture of pharmaceuticals.(2)

The Canadian Federation of Agriculture expressed its interest in the product as a constituent of pesticides. It urged that chemicals used in the manufacture of pesticides should be entered free of duty under all Tariffs.(3)

No other representations were made to the Board relating specifically to boric acid.

In support of his proposal, the Union Carbide spokesman pointed out that the product is not now made in Canada, is not likely to be made in Canada for many years and that there are no suitable substitutes for the chemical in many applications. He argued that the imposition of higher rates would not serve the best interests of the Canadian economy and would serve only to increase the costs of important Canadian-made consumer products.

In the Brussels Tariff Nomenclature, boric acid is classified under heading 28.12 when it is more than 85 per cent pure. When the product contains 85 per cent of boric acid or less, it is classified under heading 25.30. In the Canadian Customs Tariff, boric acid is entered under tariff item 208, regardless of its purity, if it is in packages weighing 25 pounds or more. If the B.T.N. were adopted for the classification of chemicals, and boric acid were deleted from item 208, provision would need to be made for the less pure product which is classified in heading 25.30.

BORIC OXIDE

Boric oxide is the only other chemical classified in heading 28.11 of the B.T.N. It is not known to be made in Canada and there are no data available regarding imports or use.

Boric oxide is entered under tariff item 208t at rates of Free, B.P. and 15 p.c., M.F.N. At the public hearing, the spokesman for the Industry Committee said that it had been listed as significant by one company which had recommended free entry for the chemical. Subsequently this company had informed the Committee that it was no longer interested in boric oxide and therefore would not appear before the Board to support the rates it recommended.(4)

(1) Transcript, Vol. 10, p. 1388
(2) Same, Vol. 87, p. 13321
(3) Same, Vol. 110, p. 16631
(4) Same, Vol. 10, p. 1382

Because no rates were proposed by others for boric oxide, the product would be subject to the general recommendation of the Industry Committee for rates of 15 p.c., B.P. and 20 p.c., M.F.N. The Committee did not indicate why these rates would be appropriate specifically for boric oxide.

OTHER INORGANIC ACIDS AND OXYGEN COMPOUNDS OF NON-METALS (EXCLUDING WATER) - B.T.N. 28.13

Heading 28.13 of the B.T.N. is a residual classification and includes a large number of chemicals only a few of which are of economic importance. A small number were brought to the Board's attention in various representations. Of these, carbon monoxide, carbon dioxide and nitrous oxide are discussed under heading 28.04 along with some of the other important inorganic gases. The others which were the subject of representations are discussed below in the order in which they were presented at the public hearing.

FLUOBORIC ACID

Fluoboric acid is a clear, colourless liquid, produced by the reaction of hydrofluoric acid and boric acid. It has been made in Canada since 1959 at Valleyfield, Quebec, only by the Nichols Chemical Company, an affiliate of Allied Chemical Canada Limited. In Canada, the major use of fluoboric acid is for the production of fluoborates which are used in electroplating and processing of light metals. It is also used in electropolishing aluminum, for cleaning and pickling various metals and as a solvent of a variety of metals.

The Canadian market was said to be small and limited essentially to Ontario and Quebec. The spokesman for the company said there were no imports nor exports of the product. The capacity of the Valleyfield plant was said to be more than adequate to supply all Canadian requirements.

Fluoboric acid is sold in Canada in 55 pound non-returnable carboys and 140 pound polyethylene carboys. At the time of the hearing, November 1960, the price of the 140 pound, polyethylene carboy, in truckloads was $24.50 per 100 pounds, f.o.b. Valleyfield; the comparable price, f.o.b. plants in the U.S.A., was said to be $19 per 100 pounds.

The competition appeared to be from one producer in the U.S.A. The spokesman said that Allied was more favourably located to serve the Canadian market and that the rapidity with which his company could make delivery was an advantage.

Tariff Considerations

Fluoboric acid is entered under tariff item 711 at rates of 15 p.c., B.P. and 20 p.c., M.F.N. At the public hearing, in November 1960, Allied Chemical Canada Limited requested that the existing rates be retained, in an item worded like heading 28.13 of the Brussels Tariff Nomenclature.(1)

In support of its proposal, Allied Chemical Canada Limited claimed that manufacturing costs are higher in Canada because the small

(1) Transcript, Vol. 10, p. 1492

size of the Canadian market does not permit large scale production. The company spokesman also made reference to the threat of competition from producers in the U.S.A.

The principal products made at the Nichols plant at Valleyfield, Quebec, are sulphuric acid, aluminum sulphate and hydrofluoric acid. Fluoboric acid is one of several products manufactured from the hydrofluoric acid. The value of sales of fluoboric acid is very small relative to the value of sales of the principal products.

Although, at the time of the hearing, the price, f.o.b. Valleyfield, was 32 per cent higher than the comparable price of the acid, f.o.b. plants in the U.S.A. yet, according to the company, there were no imports; the Canadian market for fluoboric acid was said to be supplied entirely by the Canadian producer. The spokesman for the company said that the location of the Valleyfield plant relative to consumers and the ability of the company to provide rapid service were important considerations in gaining and retaining customers. He also said that only one company in the U.S.A. was relatively close to a portion of the Canadian market "but it is not a large portion and he still is further away than we are".(1)

HYDROFLUORIC ACID

Hydrofluoric acid, or hydrogen fluoride, is a very corrosive liquid which is available from Canadian production in the anhydrous form and as a 70 per cent aqueous solution. It is produced for sale by only one company in Canada, Nichols Chemical Company Limited, an affiliate of Allied Chemical Canada Limited, at Valleyfield, Quebec. It is also produced captively at Trail, British Columbia, by Consolidated Mining and Smelting Company of Canada Limited (Cominco). Hydrofluoric acid is derived by treating fluorspar (calcium fluoride) with sulphuric acid, in a furnace. The Valleyfield plant began production of the acid in 1957.

The principal uses of anhydrous hydrofluoric acid are as a catalyst in the production of aviation and other high grade gasolines and as a fluorinating agent. Aqueous hydrofluoric acid is used mainly in polishing and etching glass, in various metal cleaning and polishing processes, in the production of fluorine-containing compounds and in other applications.

In 1956, before Nichols began production in Canada, imports were valued at $350,000, and presumably reflected the size of the market at that time. At the public hearing in 1960, the company indicated that it was operating in an expanding market. There are no published data regarding the current size of the market in Canada for hydrofluoric acid but it is probably in excess of $500,000. Imports in recent years, 1959 to 1963, have been between $50,000 and $70,000 annually, around 10 per cent of the probable Canadian use.

(1) Transcript, Vol. 10, p. 1504

Imports of Hydrofluoric Acid, 1956-63

	$'000
1956	350
1957	325
1958	95
1959	55
1960	60
1961	50
1962	70
1963	70

Source: Dept. of Industry, Chemical Import Trends

According to the spokesman for Nichols Chemical Company, the Canadian market for hydrofluoric acid is concentrated largely in Ontario and Quebec although sales are also made west of Manitoba. Almost all imports were said to be from the Cleveland area.

In 1960, at the time of the public hearing, comparable prices of hydrofluoric acid in Canada and the U.S.A. were said to be as follows:

Prices of Hydrofluoric Acid, Canada and U.S.A., 1960, in Tank Cars, f.o.b. Producing Locations

	Canada	U.S.A.	
	$Can.	$U.S.	$Can.
	- per ton -		
Anhydrous hydrofluoric acid	415	360	349
Aqueous hydrofluoric acid, 70%	310	268	260

In 1964, both Canadian and U.S. published prices of the anhydrous product were lower than in 1960.

	1964		
	Canada	U.S.A.	
	$Can.	$U.S.	$Can.
	- per ton -		
Anhydrous hydrofluoric acid	400	320	345
Aqueous hydrofluoric acid	288	214	231

Tariff Considerations

Hydrofluoric acid is entered under tariff item 711 at rates of 15 p.c., B.P., and 20 p.c., M.F.N.

At the public hearing on November 7, 1960, Allied Chemical Canada Limited requested that the existing rates be continued under a tariff item worded like heading 28.13 of the B.T.N.(1)

Consolidated Mining and Smelting Company of Canada Limited expressed an interest in the product, as a producer. The company urged that the rates of duty on chemicals used by Canadian manufacturers should not be increased.(2)

The Canadian Pharmaceutical Manufacturers Association also expressed an interest in hydrofluoric acid, as a relatively minor chemical used by its members. The Association recommended rates of 15 p.c., B.P. and 20 p.c., M.F.N. for chemicals produced in Canada and used in the manufacture of pharmaceuticals.(3)

In support of its proposal, Allied Chemical claimed that it was at a disadvantage relative to producers in the U.S.A. because of the smallness of the Canadian market, and the consequent smaller scale of the company's production. The spokesman for the company also said that a considerable proportion of the Canadian market was within competitive range of large plants in the U.S.A. and claimed that any downward revision of existing rates would seriously impair the company's ability to compete against imports.

The available information suggests that the plant at Valleyfield is comparable in size with a large number of plants in the U.S.A.(4) As a result the disability of scale, cited by the producer, would be relative to the largest plants in the U.S.A. However, the Valleyfield plant has offsetting locational advantages over producers in the U.S.A. as a result of lower costs of freight to most of the market which it serves. For example, in 1960 the cost of freight from Valleyfield, Quebec, to Maitland, Ontario, was $9.40 per ton compared with $26.80 per ton from Cleveland, Ohio. In 1964, the rate from Cleveland to Maitland was unchanged, but the rate from Valleyfield to Maitland was only $4.80 per ton. The available information suggests that the Cleveland plant would have a small freight advantage at only a very few consuming locations.

At the time of the hearing in 1960, the Canadian price for the anhydrous product was $415 a ton, 19 per cent higher than the comparable price in the U.S.A. when the latter is expressed in Canadian funds. In 1964, prices were lower in both countries, when so expressed, and the difference had narrowed to approximately 16 per cent in terms of Canadian funds.

FLUOROSILICIC ACID

Fluorosilicic acid (hydrofluorosilicic acid) is a colourless fuming liquid. At the time of the hearing, in November 1960, it was known to be produced in Canada only by the Consolidated Mining and

(1) Transcript, Vol. 10, p. 1513
(2) Same, Vol. 5, p. 715
(3) Same, Vol. 87, p. 13321
(4) Faith, Keyes and Clark, Industrial Chemicals, p. 438

Smelting Company of Canada Limited at Trail, British Columbia. Since 1962 it has also been produced by the Nichols Chemical Company at its plant at Valleyfield, Quebec. In March 1965, it was reported that the Electric Reduction Company of Canada was building a plant to produce the acid at Port Maitland, Ontario. The designed capacity was given as 25,000 tons per year. The acid may be obtained as a by-product of the manufacture of superphosphates or silicon fluorides.

The principal uses of fluorosilicic acid are in the electrolytic refining of tin and lead, the production of fluorosilicates and electroplating. It is also used for the fluoridation of water supplies and it is in this connection that Cominco expressed its interest in the product. This is also the market that the Electric Reduction plant is intended to supply.

As noted above, until 1962 Cominco was the only known producer of the acid in Canada. The company informed the Board that its production at that time was entirely for captive use. Thus, Canadian commercial requirements were supplied by imports until 1962 when Nichols began production of the acid; in 1962, imports were 85 tons, valued at $13,000, compared with 116 tons, valued at $26,600 in 1961. Imports appear to be increasing and in 1963 were 479 tons valued at $40,135. Although Erco intends to export some part of its output, the reported capacity of the Erco plant, of 25,000 tons annually, suggests that the market for the product is expected to grow very rapidly, probably as a result of greater use for fluorinating water. At the 1965 price in the U.S.A. for the acid in bulk, of $51 a ton, Erco's output at full utilization of capacity would have a value of about $1,275,000.

Imports of Hydrofluosilicic (Fluorosilicic) Acid, 1959-63

	tons	$
1959	112	15,646
1960	92	13,226
1961	116	26,618
1962	85	13,161
1963	479	40,135

Source: Trade of Canada, Imports, s.c. 8002

Tariff Considerations

Fluorosilicic acid is entered under tariff item 208 free of duty under both the B.P. and M.F.N. Tariffs.

Consolidated Mining and Smelting Company of Canada Limited (Cominco) proposed that the existing free entry be continued.(1) No other representations were made regarding the acid.

(1) Transcript, Vol. 10, p. 1526

Cominco informed the Board that, although it produced the product only for captive use, it was interested in the potentialities of the market which was developing in the northwest U.S.A., for use in fluoridation of water supplies. The company spokesman said, "we wouldn't like to see anything happen to prejudice the market in the United States ..."(1)

He also objected to the practice of the Industry Committee of proposing rates of 15 p.c., B.P., and 20 p.c., M.F.N., for products for which no other proposals were made. He said that this tended to place companies like Cominco on the defensive in having to justify rates other than these and that, if the Industry Committee felt that rates of 15 p.c., B.P. and 20 p.c., M.F.N. were appropriate, it should be required to justify them in every instance.

HYDROGEN CYANIDE

Hydrogen cyanide (hydrocyanic acid, prussic acid) is a very toxic, colourless liquid. It is not produced in Canada, although it occurs as an intermediate product in the course of the production of sodium cyanide by Shawinigan Chemicals Limited, at Shawinigan, Quebec. Its principal uses are in organic synthesis in the manufacture of acrylonitrile which is used in Buna N type rubber and synthetic textiles such as orlon. According to the spokesman for Shawinigan Chemicals the market in Canada for hydrogen cyanide was negligible in 1960.

Hydrogen cyanide would be entered under tariff item 216, "acids, n.o.p., of a kind not produced in Canada", at rates of Free, B.P. and 15 p.c., M.F.N.

At the public hearing in November 1960, Shawinigan Chemicals Limited proposed rates of 15 p.c., B.P. and 20 p.c., M.F.N.(2)

The Canadian Federation of Agriculture indicated its interest in the chemical, as a constituent of pesticides. The Federation urged that chemicals used in the manufacture of pesticides should be entered free of duty under all Tariffs.(3) If so used, the product at present may be entered free of duty under tariff item 791, or duty-free under item 219e as a material for combatting destructive pests.

The Canadian Pharmaceutical Manufacturers Association also expressed an interest in the product. The Association recommended that products not made in Canada and used in the manufacture of pharmaceuticals should be entered at rates of Free, B.P. and 15 p.c., M.F.N., unless otherwise provided for. When they are ruled to be made in Canada, the Association supported rates of 15 p.c., B.P. and 20 p.c., M.F.N.(4)

(1) Transcript, Vol. 10, p. 1527
(2) Same, Vol. 11, p. 1534
(3) Same, Vol. 110, p. 16631
(4) Same, Vol. 87, p. 13321

Shawinigan Chemicals supported its proposal in a general submission using hydrogen cyanide as an example. The spokesman for the company said that all products which are not specifically enumerated otherwise, including products of negligible importance and whether or not made in Canada, should be dutiable at rates of 15 p.c., B.P. and 20 p.c., M.F.N. If an interested party wished to have lower rates imposed on any product he could present his case for such rates during the course of the hearings.

The spokesman referred to hydrogen cyanide as a chemical which was currently of negligible economic importance but which might become important if acrylonitrile were produced in Canada. He said that if this occurred, Shawinigan Chemicals might begin to produce hydrogen cyanide, but under the existing Tariff would have to compete with imports entered at the existing rates of Free, B.P. and 15 p.c., M.F.N., until the company could obtain a made-in-Canada ruling. Shawinigan Chemicals estimated that this might take a year. When ruled made in Canada, the product would be dutiable at rates of 15 p.c., B.P. and 20 p.c., M.F.N., under tariff item 711. However, for pesticidal purposes, it would continue to be admissible duty-free under end-use items 219e and 791, if these items remain in the Tariff.

Subsequent to the public hearing, plans were announced by Imperial Oil Limited to produce acrylonitrile at Sarnia, Ontario.

The procedure recommended by Shawinigan Chemicals is essentially the reverse of the existing procedures where tariff items 208t and 711 are concerned. Under the existing Tariff, unenumerated chemicals which are not made in Canada are dutiable at Free, B.P. and 15 p.c., M.F.N., under tariff item 208t and are subject to rates of 15 p.c., B.P. and 20 p.c., M.F.N., under item 711, when they are ruled to be of a kind made in Canada.

The spokesman for the company did not indicate why rates of 15 p.c., B.P. and 20 p.c., M.F.N. were appropriate specifically for hydrogen cyanide while it is not made in Canada, nor did he show why such rates would be appropriate when the product was made in Canada. The basic premise of the Shawinigan Chemicals' argument appeared to be that Canadian manufacturers required duties of 15 p.c., B.P. and 20 p.c., M.F.N., in order to compete in the Canadian market. No evidence was produced in support of this premise with respect to hydrogen cyanide.

SILICON DIOXIDE

Silicon dioxide, or silica, occurs widely in nature in forms such as silica sand and quartz. It may also be produced by chemical processes. In the Brussels Tariff Nomenclature, naturally-occurring silicon dioxide is classified as a mineral product in Chapter 25, except for varieties constituting precious stones, which are classified in Chapter 71, or optical elements which are in Chapter 90. Heading 28.13 of the B.T.N. relates only to chemically-produced silicon dioxide.

The silicon dioxide of heading 28.13 "can be either in amorphous form (as a white powder - 'silica white', 'flowers of silica', 'calcined silica'; as vitreous granules - 'vitreous silica'; in

gelatinous condition - 'silica frost', 'hydrated silica'), or in crystals (tridymite and cristobolite forms)."(1) The heading excludes colloidal suspensions of silica (heading 38.19). The chemical forms of silicon dioxide are not produced in Canada, according to the available information.

The only form of silicon dioxide which was the subject of representations was a powder form with the brand name of "Cab-o-sil". It is produced in the U.S.A., at Tuscola, Illinois, by Cabot Corporation and is distributed in Canada by Cabot Carbon of Canada Limited. Cab-o-sil was said to be a very finely divided form of silicon dioxide whose physical properties make it particularly useful as a thixotropic agent for polyester and epoxy resins, as a precoating for sensitized papers, for varnish flatting and in several other applications.

The size of the Canadian market for chemical forms of silicon dioxide and Cab-o-sil is not known. Published data report imports of 3,099 tons of silica gel in 1964 with a value of $1,321,767, almost entirely from the U.S.A. However, some part of these imports would be of mixtures, which in the B.T.N. would not be classified under heading 28.13, and some forms of silicon dioxide might not be included in these data.

The spokesman for Cabot Carbon did not indicate the magnitude of the company's sales of Cab-o-sil in Canada. However, he informed the Board that 40 per cent of the sales were entered under tariff item 208t, as an unenumerated chemical not made in Canada, and 60 per cent were entered free of duty, under end-use item 791 or 921. Item 791 relates to materials used in manufacturing preparations for dipping, spraying, disinfecting and similar pesticide uses; item 921 relates to materials, not made in Canada, used in the manufacture of synthetic resins and plastics. The information given at the public hearing indicates that most free imports would be under item 921.

There was considerable discussion at the hearing regarding the competition between Cab-o-sil and other chemicals, particularly metallic stearates such as aluminum, calcium and magnesium stearate. The evidence suggested that stearates could be substituted for Cab-o-sil in many applications although more of the stearate than of Cab-o-sil might have to be used to achieve similar results. In general, stearates were somewhat less than half the cost per pound of Cab-o-sil. At the time of the hearing, the latter was priced at about 85 cents a pound.

Tariff Considerations

Apart from end-use considerations, silicon dioxide, the chemical form classified by B.T.N. heading 28.13, is entered under tariff item 208t, as an unenumerated chemical not made in Canada, at rates of Free, B.P. and 15 p.c., M.F.N.; some may also be entered under tariff item 297, "Silex or crystallized quartz, ground or unground," free of duty under all Tariffs. Item 297 is outside the terms of Reference 120.

(1) Explanatory Notes to the Brussels Nomenclature, Vol. 1, p. 154

At the public hearing, in November 1960, Cabot Carbon of Canada Limited proposed that the form of silicon dioxide which the company sold under the brand name of "Cab-o-sil" should be entered free of duty under both the B.P. and M.F.N. Tariffs.(1)

Three manufacturers of metallic stearates, H.L. Blanchford Limited, Mallinckrodt Chemical Works Limited and Witco Chemical Company Canada Limited, opposed the proposal of Cabot Carbon and urged that silicon dioxide of heading 28.13 should be dutiable at rates of 15 p.c., B.P. and 20 p.c., M.F.N.(2)

The Rubber Association of Canada expressed an interest in silicon dioxide as a raw material. The Association requested that chemicals which are not made in Canada should be provided for in an item worded like existing tariff item 208t but with free entry under both the B.P. and M.F.N. Tariffs.(3)

The Canadian Federation of Agriculture indicated its interest in silicon dioxide as a constituent of fertilizers. The Federation proposed free entry under all Tariffs for chemicals used in the manufacture of fertilizers.(4) The product, if so used, would be admissible duty-free at present under tariff item 663b.

Naugatuck Chemicals Division of Dominion Rubber Company Limited expressed an interest as a consumer of silicon dioxide. However, the company did not indicate its position regarding specifically rates for products not made in Canada.(5)

Thus apart from end-use considerations, two proposals were placed before the Board. Cabot Carbon and the Rubber Association recommended free entry under both the B.P. and M.F.N. Tariffs; the three manufacturers of metallic stearates urged rates of 15 p.c., B.P. and 20 p.c., M.F.N.

In support of free entry for that form of silicon dioxide known as Cab-o-sil, Cabot Carbon claimed that in its principal applications the product was generally not competitive with chemicals made in Canada. The spokesman for the company said the small size of the Canadian market made it unlikely that a product such as Cab-o-sil would be produced in Canada in the near future. He also said that 60 per cent of the imports of Cab-o-sil were entered free of duty under end-use items.

The manufacturers of stearates did not agree that Cab-o-sil was not competitive with chemicals produced in Canada. Their spokesman claimed that metallic stearates were being displaced by Cab-o-sil in several applications and urged rates of 15 p.c., B.P. and 20 p.c., M.F.N. for silicon dioxide to protect manufacturers of competitive products. However, the spokesman for the group did not indicate why such rates would be specifically appropriate in the case of silicon dioxide.

(1) Transcript, Vol. 11, p. 1588
(2) Same, Vol. 11, p. 1606
(3) Same, Vol. 165, p. 24368
(4) Same, Vol. 83, p. 12813
(5) Same, Vol. 6, p. 908

The spokesman for the Rubber Association said members of his Association had to contend with strong competition from manufacturers of rubber products in the U.S.A. He argued that the U.S. manufacturers, as a result of research, were continually introducing new chemicals into rubber which improved the properties of the products. He claimed that Canadian rubber manufacturers would face serious cost disadvantages if the chemicals which they had to use, in order to compete with potential imports, continued to be dutiable at 15 p.c. even while they were not made in Canada. He said the duty did not benefit other Canadian manufacturers because rubber producers were forced to use these chemicals in order to compete successfully, but that the 15 p.c. duty constituted a serious burden to members of the Association.

The Board has insufficient information to assess the competitive situation regarding chemical forms of silicon dioxide (including Cab-o-sil) and other products, such as metallic stearates. The import figures available indicate that imports of silica gel and silica aerogel were valued at $1.3 million in 1964. Only part of this value would pertain to forms of silicon dioxide which would be classified in heading 28.13, and it is not known whether it includes imports of Cab-o-sil, nor to what extent the imports are directly competitive with Canadian made products. The information made available at the hearing indicates that Cab-o-sil is used extensively as a thixotropic agent for polyester and epoxy resins. When used for these purposes imports may be entered under end-use tariff item 921, free of duty under both the B.P. and M.F.N. Tariffs. Sixty per cent of imports, as noted above, were said to be duty-free under this and other end-use items.

SULPHAMIC ACID

Sulphamic acid is a white, crystalline substance produced by dissolving urea in sulphuric acid. It is used mainly as a sulphating agent in liquid detergents, and to a much lesser extent as a raw material in the manufacture of coloured pigments. At the public hearings, in 1960, detergents manufactured by using sulphur trioxide, sulphamic acid or chlorosulphonic acid were said to be competitive at the retail level, although the three products listed are not substitutable for each other in the processes in which each is used.

Sulphamic acid is not made in Canada. Imports have increased rapidly in recent years and were valued at $120,000 in 1963. All imports were said to originate in the U.S.A. The spokesman for Lever Brothers Limited estimated that sulphamic acid constituted about 10 to 15 per cent of the cost of manufacturing the detergents in which it was used.

The acid is available as crystals or in granular form. The crystals have been priced, in the U.S.A., at 16 cents a pound, f.o.b. plant, for several years. The granular form is cheaper, at 14.75 cents a pound, but was said to require reduction to the fineness of the crystals before use.

In the production of pigments, sulphamic acid was said to have no substitutes. Its use for this purpose is apparently much smaller than for the production of detergents.

Tariff Considerations

Sulphamic acid is entered under tariff item 216, "acids, n.o.p., of a kind not produced in Canada", at rates of Free, B.P. and 15 p.c., M.F.N.

At the public hearing, in November 1960, Lever Brothers Limited requested that sulphamic acid be admitted free of duty under both the British Preferential and Most-Favoured-Nation Tariffs, "until such time as this product be ruled 'made in Canada', at which time we would have no objection to its reverting to the basket rates for Brussels category 28.13".(1) The "basket rates" were those proposed by the Industry Committee for products of B.T.N. 28.13 for which no other representations were made to the Board, 15 p.c., B.P. and 20 p.c., M.F.N.

The Canadian Color Makers Association also supported free entry for the product. However, the Association did not qualify its proposal to apply only while the product was not made in Canada.(2)

Chemical Developments of Canada Limited recommended similar tariff treatment for both chlorosulphonic and sulphamic acids, and supported Lever Brothers Limited's proposal for free entry of the latter.(3)

The Canadian Pulp and Paper Association expressed an interest in the product and strongly opposed any increase in the existing rates of duty for chemicals used by its members.(4)

The Canadian Federation of Agriculture listed sulphamic acid as a constituent of pesticides and urged that chemicals used in the manufacture of pesticides should be entered free of duty under all Tariffs.(5) The product could be so entered at present under tariff item 791.

The Canadian Pharmaceutical Manufacturers Association expressed an interest in sulphamic acid, as one of the less important chemicals used by its members. The Association proposed that chemicals used in the manufacture of pharmaceutical products should be entered at rates of Free, B.P. and 15 p.c., M.F.N. while they are not made in Canada, unless otherwise provided for.(6)

A group of seven manufacturers of inorganic acids opposed unqualified free entry for products which, at the time of the hearing, were not made in Canada. Their spokesman said that if free entry or low rates were set they should apply only until the product is made in Canada. When ruled made in Canada they recommended rates of 15 p.c., B.P. and 20 p.c., M.F.N.(7)

(1) Transcript, Vol. 11, p. 1632
(2) Same, Vol. 11, p. 1640
(3) Same, Vol. 11, p. 1646
(4) Same, Vol. 85, p. 13006
(5) Same, Vol. 110, p. 16631
(6) Same, Vol. 87, p. 13321
(7) Same, Vol. 9, p. 1341

Thus, there appeared to be no serious disagreement with respect to the rates proposed; all parties making representations at the hearing seemed willing to accept the proposal of free entry for sulphamic acid. However, the acid manufacturers and Lever Brothers urged that free entry be permitted only while the product was not made in Canada; the Color Makers Association did not qualify its proposal for free entry.

In support of qualified free entry, the spokesman for the acid manufacturers said that unqualified free entry was a deterrent to the manufacture of chemicals in Canada. Those consumers who supported free entry or low rates did so generally on the grounds that higher rates would affect their costs and therefore their ability to compete effectively.

Chemical Developments of Canada Limited expressed its concern lest different rates should be imposed on chlorosulphonic and sulphamic acids. Its spokesman said the products into whose manufacture these acids entered were competitive and he was concerned lest a competitive advantage should be given to one or other of the end products as a result of different rates being imposed on the acids. Neither acid is made in Canada.

SULPHUR TRIOXIDE

Sulphur trioxide (sulphuric anhydride) exists in three solid modifications, alpha, beta and gamma. The alpha form appears to be stable but the gamma and beta forms are slowly converted to the alpha form and therefore usually have a stabilizer added to prevent this conversion. The form which is of importance in Canada was said to be the gamma modification.

Sulphur trioxide is used in Canada primarily in the manufacture of low-salt, liquid synthetic detergents. It may also be used to prepare oleums. It is not available from Canadian production in the usual commercial form, as a stabilized solution. All supplies were said to be imported from the U.S.A. Import statistics are not available.

Sulphur trioxide, in any one of the solid modifications (alpha, beta or gamma), is entered under tariff item 208t at rates of Free, B.P., 15 p.c., M.F.N. At the time of the hearing in 1961, sulphur trioxide, in its usual stabilized commercial form, was entered under tariff item 220a(i) at rates of 15 p.c., B.P. and 20 p.c., M.F.N. In 1961, this form also was ruled to be dutiable under tariff item 208t.

At the public hearing, in November 1960, Procter and Gamble Company of Canada Limited proposed that sulphur trioxide, in the form of a stabilized solution, be duty-free under both the B.P. and M.F.N. Tariffs, until made in Canada; when made in Canada, the company would not object to rates of 15 p.c., B.P. and 20 p.c., M.F.N. for it.(1)

(1) Transcript, Vol. 11, p. 1652

In support of free entry, the company spokesman said that suitable substitutes are not available and therefore the imposition of duties would not serve to protect any segment of Canadian industry.

OTHER PRODUCTS OF HEADING 28.13

Heading 28.13 of the B.T.N. is a general classification for a large number of chemicals only a few of which were the subject of formal presentations to the Board. As noted earlier, carbon monoxide, carbon dioxide and nitrous oxide are discussed with the compressed gases of heading 28.04; the other products which were the subject of formal submissions have been dealt with in the foregoing.

In addition a number of products were brought to the Board's attention mainly in expressions of end-use interests.

The Canadian Pharmaceutical Manufacturers Association expressed an interest in hydroiodic acid, hydrobromic acid (both aqueous and anhydrous), hypophosphorus acid and perchloric acid. It is not known whether any of these are made in Canada. The Association proposed that chemicals not made in Canada and used in the manufacture of pharmaceuticals should bear rates of Free, B.P. and 15 p.c., M.F.N. unless otherwise provided for; when they are made in Canada the rates should be 15 p.c., B.P. and 20 p.c., M.F.N.[1] The spokesman for the Association gave no indication why the rates he proposed would be appropriate specifically for the products to which they were intended to apply.

Naugatuck Chemicals Division of Dominion Rubber Limited expressed an interest, as a consumer, in selenium dioxide, but did not indicate what rates should apply. Its spokesman said he would not object to the rates proposed by the producers of chemicals for the products which they manufactured. However, no producer made a proposal respecting selenium dioxide and it is not known whether the product is manufactured in Canada.

In addition to the above, there are many other chemicals classified under heading 28.13 for which no information is available. The Industry Committee proposed that all chemicals which were not the subject of specific proposals by others should be subject to rates of 15 p.c., B.P. and 20 p.c., M.F.N. The spokesman for the Committee did not indicate why such rates would be appropriate for the specific chemicals to which they were intended to apply. In many instances the Committee's proposal would involve substantial increases in the existing rates. For example, except for the proposal of the Consolidated Mining and Smelting Company regarding fluorosilicic acid, this product which is now entered free of duty under the B.P. and M.F.N. Tariffs, would also have been included in the Committee's general proposal.

(1) Transcript, Vol. 87, p. 13321

HALIDES, OXYHALIDES AND OTHER HALOGEN COMPOUNDS OF NON-METALS - B.T.N. 28.14

In introducing the heading at the public hearing in November 1960, the spokesman for the Industry Committee stated:

> "Of the many products which could be classified by this heading, only a few have significant commercial importance ... the Committee believes that the Board has received submissions on all products having significance."(1)

Only three products under the heading were the subject of formal submissions to the Board: phosphorus oxychloride, phosphorus pentachloride and phosphorus trichloride; five others were the subject of various expressions of interest.

The Electric Reduction Company of Canada Limited (Erco) reported that phosphorus oxychloride, phosphorus pentachloride and phosphorus trichloride were not made in Canada and that the size of the Canadian market made their manufacture uneconomic. Their importation from the United Kingdom was said to be impractical because of the difficulties and hazards of packing and transportation. Information on phosphorus trichloride indicated that imports came from the United States where there were four producers with an average annual production, of the trichloride and oxychloride combined, of 10 million pounds per plant.

Of the three products, only phosphorus trichloride was the subject of some discussion. The submission by Erco noted that the market for the trichloride had expanded significantly in 1960, and was expected to be of the order of 400,000 to 500,000 pounds for the year as a whole. At the published price in the U.S.A. of 12½ cents per pound, this quantity would have a market value of about $50,000 to $60,000. Imports in the first six months of 1960 were valued at $34,290. The growth of the Canadian market was said to be dependent on the growth of the demand for liquid synthetic detergents and rubber anti-oxidant intermediates. The market expansion was confirmed by Lever Brothers Limited, a leading soap and detergent manufacturer, whose spokesman indicated that phosphorus trichloride was also used in the manufacture of bar soap.

In general, the available data suggest that most products of heading 28.14 are of little economic significance and that very few, if any, are made in Canada. Apart from phosphorus trichloride the following are known to have been imported, at least in some years:

- boron trichloride
- boron trifluoride
- sulphur chloride
- sulphur hexafluoride
- thionyl chloride

Imports of sulphur hexafluoride are of significant value, $80,000 in 1963; imports of the others listed are less than $10,000 in most years.

(1) Transcript, Vol. 12, p. 1661

Tariff Considerations

Phosphorus trichloride, phosphorus oxychloride and phosphorus pentachloride were reported by the Electric Reduction Company of Canada Ltd. to be dutiable under tariff item 208p, "phosphorus and compounds thereof, n.o.p.", free under the British Preferential Tariff and dutiable at 20 p.c. under the Most-Favoured-Nation Tariff. Other phosphorus compounds of heading 28.14 would also be entered under item 208p. All other known products of the heading which were mentioned at the hearing or for which there is any record of imports, are entered under item 208t as chemicals of a kind not produced in Canada, free of duty under the British Preferential Tariff and at 15 p.c. under the Most-Favoured-Nation Tariff. Phosphorus oxychloride is understood to be entered under tariff item 208t rather than under item 208p.

The Electric Reduction Company made the following proposal with respect to phosphorus trichloride, phosphorus oxychloride and phosphorus pentachloride.

> "The chemicals are not now and, so far as we can tell, are not likely to be imported from the United Kingdom. No purpose would, therefore, be served by recommending any change in the B.P. rate. The most-favoured-nation rate of 20 per cent would, we believe, be fair if the chemicals were Canadian made. However, until such time as the chemicals are made in Canada, we believe that lower rates of duty would assist in the development of the Canadian market and at the same time encourage the consideration of Canadian manufacture as soon as the market would appear to justify the step. The company, therefore, recommends that the M.F.N. rates be reduced to 15 per cent on phosphorus oxychloride and pentachloride and 10 per cent on phosphorus trichloride until they are ruled 'made in Canada', at which time the present rate of 20 per cent should automatically be re-applied."(1)

The submission by Lever Brothers Limited on <u>phosphorus trichloride</u> indicated that the company supported the proposal of Erco.(2)

The Naugatuck Chemicals Division of Dominion Rubber Company Limited took a general position with respect to many product of interest to the company, including <u>boron trifluoride</u>, <u>phosphorus trichloride</u>, <u>sulphur chloride</u> and <u>thionyl chloride</u> of B.T.N. heading 28.14. In brief, the company's position was that "We could not maintain our position as a manufacturer of chemicals in Canada if placed under a competitive disadvantage caused by higher duty rates on raw materials, unless we receive commensurate protection for the products we make."(3) The rates proposed by others for these products would have the effect of increasing either the B.P. rate or both the B.P. and M.F.N. rates, when these products are ruled to be made in Canada. However, Naugatuck Chemicals did not indicate whether this increase in rates when the products are ruled made in Canada would place it "under a competitive disadvantage".

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(1) Transcript, Vol. 12, p. 1667-8
(2) Same, Vol. 12, p. 1673
(3) Same, Vol. 6, p. 902

The Rubber Association of Canada expressed an interest in sulphur monochloride. The spokesman for the Association said he favoured the continuation of a provision such as that of tariff item 208t for products which are not made in Canada, but urged that the provision be for duty-free entry under both the British Preferential and Most-Favoured-Nation Tariffs. In a general submission the Association opposed any increase in rates for chemicals used by its members.(1)

The Canadian Pharmaceutical Manufacturers Association expressed its interest in arsenic trichloride, boron trifluoride, phosphorus pentachloride and thionyl chloride. The Association proposed that chemicals which are used in the manufacture of pharmaceuticals should be dutiable at rates of Free, B.P. and 15 p.c., M.F.N., unless otherwise provided for until they are made in Canada; when they are ruled to be made in Canada, the Association supported rates of 15 p.c., B.P. and 20 p.c., M.F.N. for these products.(2)

The Industry Committee proposed that an item should be established in the Customs Tariff, worded as is B.T.N. heading 28.14, to provide rates of duty of 15 p.c., B.P. and 20 p.c., M.F.N. for all products so classified for which no more specific representations had been made.

No information was presented to indicate why the rates of duty which were proposed specifically for the various products were considered to be appropriate, nor why rates of 15 p.c., B.P. and 20 p.c., M.F.N. were appropriate for these products when made in Canada.

The Industry Committee took the general view that the heading rates should apply to all products for which no other representation had been made. The effect of this proposal can be illustrated with respect to thionyl chloride under heading 28.14 by the following exchange:

Q: "Does this mean...that when the Committee was under the impression that thionyl chloride was of some small importance it recommended rates of 0 and 15?

A: "Yes.

Q: "And now that it learns that it is of no importance it recommends rates of 15 and 20?

A: "Yes. The Industry Committee, reporting for the manufacturers or users of this material, also reported 0 - 15; and now, since none of them is interested in it we would suggest that it get the heading rate."(3)

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(1) Transcript, Vol. 165, p. 24368
(2) Same, Vol. 87, p. 13321
(3) Same, Vol. 12, p. 1664

SULPHIDES OF NON-METALS; PHOSPHORUS TRISULPHIDE - B.T.N. 28.15

Heading 28.15 of the Brussels Tariff Nomenclature provides for: "Sulphides of non-metals; phosphorus trisulphide". Although a large number of such chemicals are known, few of them have commercial importance in Canada. At the public hearing in November 1960, only three products of this heading were the subject of representations to the Board, namely carbon disulphide, phosphorus pentasulphide and phosphorus sesquisulphide. The Industry Committee recommended that all other products of the heading be dutiable at the rates proposed for the heading itself, namely 15 p.c., B.P. and 20 p.c., M.F.N.

CARBON DISULPHIDE

The Product and The Industry

Carbon disulphide, or carbon bisulphide, is a clear, colourless or faintly yellow, very inflammable, highly toxic liquid. It is almost odourless when pure, but the commercial product has a strong, rotten egg odour. It is soluble in alcohol, benzene or ether, but only slightly soluble in water.

Carbon disulphide has traditionally been produced by the reaction of charcoal or coke with molten sulphur in direct-fired cast iron retorts or electric furnaces. A recent, more economic, process substitutes the methane of natural gas, for charcoal and coke, as the source of carbon. Because of its toxicity and inflammability, purified liquid carbon disulphide is generally stored under a blanket of water.

The sole Canadian producer, until 1964, was Cornwall Chemicals Limited, which has operated a plant using the traditional charcoal process, at Cornwall, Ontario, since January 1942. The capacity of the plant has been expanded from time to time to meet increased demand. At the public hearing on November 9, 1960, the spokesman for the company stated that the more recent of the two large expansions had occurred in 1957. This was reported to have added about 60 per cent of the company's carbon disulphide capacity.[1] The capacity of the Canadian plant has not been made public, but the nearest U.S. competitor, at Penn Yan, N.Y., which was said to be somewhat smaller, is reported to have a capacity in the neighbourhood of 10,000 tons per annum.[2] Like the Canadian plant it uses the charcoal and coke process.

In June 1964, Thio-Pet Chemicals Limited announced that it would build a plant at Fort Saskatchewan, Alberta, to manufacture carbon disulphide. This plant was expected to be in operation near the end of 1964, with a capacity of around 2,500 tons annually.[3] In July 1965, it was reported that Cornwall Chemicals would build a second plant at Cornwall. This report did not indicate whether the new plant would supersede the existing establishment.

(1) The Journal of Commerce, New York, December 20, 1956
(2) Chemical and Engineering News, Aug. 26, 1963, p. 26;
Transcript, Vol. 12, p. 1709
(3) Globe and Mail, June 9, 1964

The principal raw materials used in the production of carbon disulphide, by Cornwall Chemicals, are sulphur, charcoal and coke. At the time of the hearing, the company used Canadian charcoal and retorts produced in Canada, but imported sulphur and coke from the United States; it has subsequently advised the Board that it is using Canadian sulphur. Imported coke constitutes a very small percentage of the total cost of materials used in the production of carbon disulphide.

In 1957, most plants in the U.S.A. which used the charcoal and coke process had capacities of 20,000 to 30,000 tons annually.(1) By 1960, at the time of the public hearing, the transition from the use of charcoal and coke to natural gas as the source of carbon was well advanced. Trade sources estimated that 40 per cent of the United States production in 1958 was from methane; by the beginning of 1964 these sources estimated that 75 per cent of U.S. capacity was based on the use of methane.(2) Plants using the newer process are located in West Virginia, Delaware and Alabama.

The natural gas process was said to result in a significantly lower unit cost of production than the retort process, partly because it lends itself more readily to large scale production.(3) The size of plant for an economic run was said to be too large to warrant the construction of a natural gas process plant in Canada, particularly in view of existing facilities. Trade journals, however, reported that the new plants at Fort Saskatchewan and at Cornwall would use natural gas and sulphur.

The Market

Information which was made available in the course of the public hearing indicated that the consumption of carbon disulphide in Canada exceeded 10,000 tons annually, in 1960, which, at list prices, would have had a value of more than one million dollars. Apart from one user in Alberta, all consumers who purchased carbon disulphide in bulk were located in Ontario and Quebec. The Alberta plant, which began the production of xanthates in 1960, at first imported its requirements of carbon disulphide, but since then has purchased the Canadian product.(4)

In Canada, about 75 per cent of the total use is in the manufacture of regenerated cellulose for the production of rayon and transparent cellulose film. Other uses are in the production of rubber chemicals, pesticides, and xanthates for mineral separation.(5) Cornwall Chemicals also uses carbon disulphide captively in the production of carbon tetrachloride.(6) In the United States, also, about 75 per cent of the carbon disulphide consumption is for the production of regenerated cellulose.(7)

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(1) Faith, Keyes and Clark, Industrial Chemicals, 1957, p. 231
(2) Oil, Paint and Drug Reporter, February 10, 1964, p. 4
(3) Transcript, Vol. 12, p. 1687-8
(4) Same, Vol. 12, p. 1690; Vol. 72, p. 10969
(5) Same, Vol. 12, p. 1680
(6) Same, Vol. 42, p. 6253
(7) Oil, Paint and Drug Reporter, Feb. 10, 1964, p. 4

The Canadian market is supplied almost entirely by Cornwall Chemicals. At the public hearing its spokesman said that the company had supplied at least 90 per cent of the Canadian demand in each year since the plant began operations in 1942. The available information indicates that imports in 1962 and 1963 were less than one per cent of Canadian use. All imports are from the U.S.A.

Except for 1956 and 1960, imports were approximately 300 tons or less, in each of the ten years, 1954-63. In 1956, 618 tons were imported, mainly by Cornwall Chemicals, to supplement the company's production prior to the expansion of capacity in 1957. The importation of 1,423 tons in 1960 was attributed by the company to the extension of the U.S. delivered price to the major Canadian market area. A reduction of the Canadian price was reflected in a decrease of imports to 322 tons in 1961.

Imports of Carbon Disulphide
Selected Years, 1954-63

	tons	$'000
1954	262	27
1956	618	59
1958	13	2
1959	315	34
1960	1,423	147
1961	322	34
1962	53	7
1963	42	5

Source: D.B.S., Trade of Canada, Imports, s.c. 8395

The company representative also stated that exports have been negligible. He attributed this situation to the U.S. Tariff of $10\frac{1}{2}$ per cent and the relatively high shipping cost to most consuming points in the U.S.A. The hazardous nature of the material was said to render overseas shipments impractical.

Pricing Policy and Prices

In 1960, carbon disulphide in tank car lots was sold on a delivered basis both in Canada and the U.S.A. Under this pricing policy, on shipments to Canadian destinations, producers in the U.S.A. prepaid the freight to the border and Canadian purchasers paid the balance of the freight cost to their plants. At the public hearing, the spokesman for Cornwall Chemicals said that at least one producer in the U.S.A. had extended his delivered price to Canadian destinations in 1960.(1) Cornwall Chemicals met this competition by reducing its delivered price from $110 to $99 a ton. The basis of sale in the U.S.A. was changed in 1961 and is now f.o.b. producer's works, freight equalized. Since 1962 the price in the U.S.A. has been $85 a ton, f.o.b. works; in Canada the price, delivered to consumers, has been

(1) Transcript, Vol. 12, p. 1682, 1688, 1701

$102 a ton. In Canada sales are still priced on a delivered basis and prices are negotiated with bulk buyers.

The precise effect of the change in pricing policy in the U.S.A. on the competitive position of the Canadian producer is not known. However, if the base price is maintained, the change in the U.S.A. from a delivered basis to a freight equalized basis should be advantageous to the Canadian producer.

Prices of Carbon Disulphide in Canada and the U.S.A., Tank Car Lots, f.o.b. Buyer's Works, 1959-65

	U.S.A.		Canada	
	High	Low	High	Low
	$ U.S. per ton		$ Can. per ton	
1959	109	109	110	110
1960	109	104	110	99
1961	104	90	102	99
1962	85[a]	85[a]	102	102
1963	85[a]	85[a]	102	102
1964	85[a]	85[a]	102	102
1965	85[a]	85[a]	102	102

(a) f.o.b. seller's works, freight equalized

Source: Oil, Paint and Drug Reporter and Canadian Chemical Processing

Transportation

As Cornwall Chemicals sells carbon disulphide on a delivered basis, the amount of freight which the company absorbs affects the net return at plant. In 1960, all buyers who purchased in bulk from Cornwall Chemicals were located in Ontario and Quebec; about 75 per cent of the company's sales were for the manufacture of regenerated cellulose, Courtaulds (Canada) Limited, at Cornwall, being the principal buyer. On sales to Courtaulds the return to Cornwall Chemicals would be reduced only by the small cost of transfer of the product between the two plants.

The plant in the U.S.A. nearest Cornwall is at Penn Yan, N.Y. In mid-1963 the cost of freight from Penn Yan to Cornwall was $22.20 per ton and the published price, f.o.b. producer's works in the U.S.A. was $85 a ton. Thus, in 1963, the laid-down cost at Cornwall, on purchases from Penn Yan or equalized on Penn Yan, would be approximately $114 a ton in Canadian funds. This compares with the published delivered price from Cornwall Chemicals of $102 per ton. The competitive situation would not seem to be appreciably different at other major consuming points in Ontario and Quebec.

Tariff Considerations

Carbon disulphide is one of the products enumerated in tariff items 208 and 219e:

	British Preferential Tariff	Most-Favoured-Nation Tariff	General Tariff
Item 208: (in part)			
Carbon bisulphide, n.o.p.	Free	Free	Free
Item 219e			
Chloropicrin, ethylene oxide, methyl bromide, methyl formate, cyanides, carbon bisulphide, acrylonitrile, or mixtures containing any of these, for use in combatting destructive insects or pests..	Free	Free	Free

At the hearing in November 1960, Cornwall Chemicals Limited recommended that carbon disulphide be dutiable at rates of 15 p.c., B.P. and 20 p.c., M.F.N., in an item worded like heading 28.15 of the Brussels Tariff Nomenclature.(1)

The Primary Textiles Institute,(2) principally on behalf of Courtaulds (Canada) Limited, did not specify what rates it considered appropriate, but asked the Board to recommend:

> "rates of duty on carbon bisulphide which are no more than adequate to compensate for the competitive disadvantages of producing in Canada compared with the U.S., bearing in mind the rates of duty applicable to viscose textile products."(3)

Under questioning, the spokesman for the Institute made his position clearer when he said that he considered that some nominal rate such as 5 p.c., M.F.N., would be adequate to offset the occasional small declines in U.S. prices.(4)

At an earlier hearing, on September 15, 1960, Naugatuck Chemicals Division of Dominion Rubber Limited, included carbon disulphide in a list of raw materials in which it had an interest and stated:

> "We take no issue with the rates which are being proposed to you by the producers of these materials, providing that the Board also recommends those rates which will be proposed ... for the products which we manufacture."(5)

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(1) Transcript, Vol. 12, p. 1686
(2) Now the Canadian Textiles Institute
(3) Transcript, Vol. 12, p. 1719
(4) Same, Vol. 12, p. 1754
(5) Same, Vol. 6, p. 900

Tariff item 219e was considered by the Board at the hearing on pesticides, November 20 to 23, 1962. Although there was no specific reference to carbon disulphide at that time, some Canadian formulators of pesticides recommended that item 219e be eliminated.(1) On the other hand, the spokesmen for the National Farmers Union and the Canadian Federation of Agriculture urged that pesticides and raw materials used in their manufacture should continue to be entered free of duty.(2) A more detailed discussion of item 219e occurs in the part of the report on B.T.N. heading 38.11.

All known imports of carbon disulphide have been from the U.S.A. As that country is likely to continue to be the sole foreign source of supply, only the Most-Favoured-Nation Tariff is significant for imports and only the competitive situation with respect to suppliers in the United States is considered relevant.

The proposal of Cornwall Chemicals was the only one that specified rates for the product. The company presented no arguments relating directly to the particular rates proposed. However, it argued that:

> "If a chemical can be purchased in Canada at a price which is reasonably comparable with the price prevailing elsewhere, it is, we believe, highly appropriate that public policy encourage the purchase from the Canadian source. Such a policy assures maximum economic utilization of Canadian materials and labour and obviates unnecessary and aimless dependence on foreign sources for essential industrial materials. The proposal submitted by the company relative to carbon bisulphide is intended to assure that domestic requirement for this material is supplied from Canadian production. It is our expectation that its adoption would not entail any hardship for users. For these reasons, we respectfully suggest that carbon bisulphide be dutiable at the rate proposed for heading 28.15, i.e., 15 per cent B.P. and 20 per cent M.F.N."(3)

The spokesman pointed out that the intention in proposing these rates was to enable the company to establish a sufficient differential between laid-down costs of Canadian and U.S. material to induce Canadian consumers to purchase only the Canadian carbon disulphide. Under questioning, he added that he believed that his company had higher production costs than did plants in the U.S.A. He noted that the Canadian market was too small to support a plant comparable in size with the plants in the U.S.A. which use the newer process based on natural gas. He contended that the present plant capacity was more than sufficient to supply all Canadian requirements and that the company required all of the Canadian market to operate efficiently.

The combination of circumstances arising from the new plants in the U.S.A. and the readiness of one or more producers in that country, in 1960, to deliver the product at U.S. prices was emphasized by

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(1) Transcript, Vol. 108, p. 16332
(2) Same, Vol. 107, p. 16248; Vol. 110, p. 16631
(3) Same, Vol. 12, p. 1686

the Canadian producer in support of the proposed M.F.N. rate. As noted above, the plants in the U.S.A. which use natural gas are said to have lower production costs, but these would have to be substantial to offset the advantage of location, in terms of freight costs, which the Canadian producer has relative to most, if not all, of the Canadian market. Even with the present duty-free entry the plant at Cornwall has been able to supply the market in the Edmonton area, at least until 1964. In view of the high costs of transportation, it is likely that the new plant at Fort Saskatchewan, Alberta, will supply this market in the future.

The discussion at the hearing drew attention to the relative bargaining positions of the then sole Canadian producer and the principal consumer. With duty-free entry, as at present, the Canadian producer has supplied almost all of this customer's needs, although in 1960 the company had to lower its price to meet the competition from the U.S.A. The company's spokesman said that this would not have been necessary if there had been a duty of 20 per cent on imports of carbon disulphide at that time.

The Primary Textiles Institute made no formal rate proposal. It suggested, however, that the problem of occasional importations could be taken care of by some nominal rate of duty such as five per cent. The spokesman for the Insitute asked the Board to bear in mind that the Canadian producer of carbon disulphide had operated successfully since 1942 under the present duty-free situation. He contended that any increase in the cost of carbon disulphide would have a substantial impact on the cost of producing viscose products. He noted that the rates recommended for viscose products under Reference 125 were predicated on the then existing cost structure, with free entry for carbon disulphide. He indicated that any significant change in this cost structure would entail hardship for the textile industry.[(1)]

PHOSPHORUS PENTASULPHIDE

Phosphorus pentasulphide is a yellow crystalline solid made by fusing phosphorus and sulphur. It is used principally as a component of oil additives in the manufacture of pressure lubricants, and also in the manufacture of organic thiophosphates for ore flotation and in insecticides.

Electric Reduction Company of Canada Limited (Erco) produced this product in Canada during World War II, but it is not now made here. The company claimed that it has the raw materials, plant and know-how to make it, but "cannot see its way to resume production in Canada on an economic scale."[(2)]

Erco estimated that the Canadian market consumes about one million pounds of phosphorus pentasulphide annually, but that much of this would be imported as a component of a manufactured product. The price of phosphorus pentasulphide has been listed for several years in the United States at $11\frac{1}{2}$ cents per pound, solid material in drums, carload lots, f.o.b. works.

(1) Transcript, Vol. 12, p. 1718-9
(2) Same, Vol. 12, p. 1757

Phosphorus pentasulphide is entered under tariff item 208p, "phosphorus and compounds thereof, n.o.p.", at rates of Free, B.P. and 20 p.c., M.F.N. For its principal use, for the manufacture of oil additives, it may be entered under end-use item 220e, Free, B.P. and 5 p.c., M.F.N.

At the public hearing in November 1960, Electric Reduction Company of Canada Limited, the former manufacturer of the product, and Monsanto Canada Limited, a manufacturer of additives which contain it, proposed rates of Free, B.P., and 5 p.c., M.F.N., for phosphorus pentasulphide, while it is not produced in Canada. When it is produced in Canada, Erco recommended a rate of 20 p.c., under the M.F.N. Tariff.(1) The company did not specify what B.P. rate should apply at that time.

According to Erco, it is unlikely that this product will be produced in Canada in the near future and imports will probably continue to be from the U.S.A. It is significant that the rates proposed, Free, B.P. and 5 p.c., M.F.N., are those which apply to the product when it is imported for the manufacture of additives, its principal application in Canada.

Monsanto claimed that there was no substitute for phosphorus pentasulphide in the production of the particular products which the company manufactured. The company spokesman said that an increase in duty would "add substantially to the cost of producing additives."(2)

Although Erco recommended that the M.F.N. rate be increased from 5 p.c. to 20 p.c. when the product is produced in Canada, the company gave no indication of why a rate of 20 p.c. would be specifically appropriate for the product at that time.

PHOSPHORUS SESQUISULPHIDE

Phosphorus sesquisulphide, also known as tetraphosphorus trisulphide, is a yellow crystalline solid formed by the reaction of yellow phosphorus and sulphur. At the public hearing, the only use mentioned for this material was in the manufacture of "strike anywhere" matches, for which purpose there was said to be no substitute.

The sole Canadian producer of this chemical is Electric Reduction Company of Canada Limited, at Buckingham, Quebec. The company spokesman said the product

> "has been manufactured by the company for a great many years but the Canadian market is not in itself sufficient to justify manufacture..."(3)

Exports which in recent years have accounted for about 40 per cent of total sales are to several foreign countries, though not to the U.S.A. In the five years 1958-62 the consumption reported by the D.B.S. averaged about 41,500 pounds per annum, valued at about $16,700, an average value of slightly more than 40 cents a pound. These data account for only part of phosphorus sesquisulphide used in the production of matches.

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(1) Transcript, Vol. 12, p. 1758, 1768
(2) Same, Vol. 12, p. 1768
(3) Same, Vol. 12, p. 1760

In the U.S.A. for several years the published price has been 38 cents a pound, for the product in drums, in carload lots, f.o.b. works.

Phosphorus sesquisulphide is entered free of duty under the B.P. Tariff and at 20 p.c. under the M.F.N. Tariff, under item 208p, "phosphorus and compounds thereof, n.o.p." Erco recommended continuation of the existing rates. The company spokesman stated that:

> "The M.F.N. rate of 20 per cent enables the company to retain a reasonable share of the Canadian market, against foreign competition, thus assisting in maintaining production in a sector of our works and keeping a number of Canadian in year-round employment."(1)

He added that "there are no imports, or likelihood of imports from U.K." When questioned further, he stated that "the costs of phosphorus are higher in the United Kingdom than in Canada, and phosphorus forms a significant percentage of the raw materials, namely, 56 per cent of the finished product."(2)

No information was submitted as to why a duty of 20 p.c. was necessary to protect the company's position in the Canadian market, nor as to the extent, source or nature of the foreign competition. Moreover, according to the company spokesman about 40 per cent of Erco's production is exported, indicating that the company is competitive in foreign markets.

OTHER PRODUCTS OF HEADING 28.15

A number of other products are classified under B.T.N. heading 28.15, but no representations relating specifically to any of them were received by the Board. The Industry Committee's proposal that an item be created, worded as is heading 28.15 of the B.T.N., with rates of 15 p.c., B.P. and 20 p.c., M.F.N., was intended to apply to all products classified in the heading for which no other proposals were made to the Board.

Under item 208 of the Customs Tariff, there is provision for free entry under all Tariffs, for "sulphide of arsenic". It is probable that this provision applies not only to the artificial arsenic sulphides of B.T.N. heading 28.15, but also to natural arsenic sulphides of B.T.N. heading 25.29. If the provision for arsenic sulphides in item 208 is deleted and an item intended to have the same scope as heading 28.15 is adopted, the natural arsenic sulphides would be properly classified under some other item of the Customs Tariff, possibly item 711 as unenumerated articles. Their classification under item 711 would involve a substantial increase in rates of duty, from free entry to 15 p.c., B.P. and 20 p.c., M.F.N. unless specific provision is made for natural arsenic sulphides.

(1) Transcript, Vol. 12, p. 1760
(2) Same, Vol. 12, p. 1764

AMMONIA, ANHYDROUS OR IN AQUEOUS SOLUTION - B.T.N. 28.16

The Product and the Industry

Ammonia is a gas under atmospheric pressure but can be readily liquefied. It has an unpleasant, irritating odour and can cause serious damage to the skin, eyes and breathing passages. It is very soluble in water, forming ammonium hydroxide (aqua ammonia) which is also classified under heading 28.16 of the Brussels Tariff Nomenclature.

Ammonia is produced by the chemical combination of hydrogen and nitrogen, under high temperature and pressure, in the presence of a catalyst. The nitrogen is obtained by fractional distillation of liquid air or by burning hydrogen in air to remove the oxygen (nitrogen constitutes about 80 per cent of the air, by volume). Most of the hydrogen that is used is obtained from natural gas. However, at Trail, B.C. an abundance of sufficiently cheap electricity enables the Consolidated Mining and Smelting Company of Canada, Limited (Cominco) to obtain hydrogen by the electrolysis of water, and Dow Chemical of Canada, Limited, at Sarnia, Ontario, obtains large quantities of hydrogen for use in the manufacture of ammonia as a by-product of its chlorine-caustic soda production.

Estimated Production Capacity for Ammonia, 1960, 1964 and 1967

Company and Location	Estimated Capacity 1960	1964	1967
	'000 tons per year		
Consolidated Mining and Smelting Company of Canada, Limited, Calgary	118	118	118
Trail	92	100	150
Western Coops., Calgary	-	-	70
Sherritt-Gordon, Ft. Saskatchewan	65	80	158
Northwest Nitro, Medicine Hat	36	40	230
Simplot Chem., Brandon, Man.	-	-	100
Total West	311	338	826
Cyanamid, Niagara Falls	72	75	350
Hamilton	52	60	-
C.I.L., Millhaven	65	73	73
Sarnia	-	-	350
Brockville Chem., Maitland	70	80	150
Dow Chem., Sarnia	36	36	175
Brunswick Mining, Belledune Pt., N.B.	-	-	350
Fundy Chemical, Dorchester Cape, N.B.	-	-	17
Total East	295	324	1,465
Canada	606	662	2,291

Source: Transcript, Vol. 13, p. 1782, 1835; Trade magazines and newspapers

In 1964 there were nine ammonia plants in Canada, owned by eight companies and having a productive capacity of approximately 700,000 tons of ammonia per year. All of the plants were located in three provinces, Ontario, Alberta and British Columbia. The productive capacity was about evenly divided between Eastern and Western Canada. The capacity in 1964 was substantially greater than at the time of the public hearing in late 1960, and reflected the rapidly growing demand for nitrogenous fertilizers in Canada and the U.S.A. The demand for ammonia is currently increasing at an even more rapid pace and it appears that by 1967 capacity in Canada will be for about 2.3 million tons annually, four times as much as in 1960 and more than triple that of 1964.

The Market

Ammonia is one of the most important industrial chemicals used in Canada and domestic sales are very substantial, amounting in 1962 to 172,000 tons with an estimated value, at $80 per ton, of approximately $14 million. Imports are a negligible part of domestic supplies. Although sales in Canada, by Canadian producers, are very substantial, two thirds of the output is used captively in the production of nitrogenous fertilizers such as ammonium nitrate, ammonium phosphate, urea and others and only about one third of the production enters commerce, almost entirely for domestic consumption. In 1964, the use of ammonia in Canada by consumers who purchase their supplies appears to have been larger than in 1962. It is estimated that domestic sales in 1964 were about 210,000 tons and captive use around 460,000 tons with a total estimated value at plant of about $50 million.(1)

Supply and Domestic Disappearance of Ammonia, 1958-64

Year	Production	Imports	Exports	Domestic Disapp.	Domestic Sales
		- '000 tons -			
1958	366	17	13	370	128
1959	400	6	16	390	134
1960	478	3	21(a)	460	143
1961	513	7	26	494	166
1962	598	1	20(a)	579	172
1963	651	3	6(a)	648	186(a)
1964	669	30	9(a)	690	210(a)

(a) Estimated from incomplete data

Source: D.B.S., various publications; Transcript, Vol. 13, p. 1836; Vol. 82, p. 12559; U.S. trade statistics

(1) Assumes $84 per ton for merchant sales and $75 per ton for captive use

Canadian production and use of ammonia has been increasing rapidly in recent years. In the five years, 1959 to 1964, output and domestic use have risen by two thirds, and estimated sales by 37 per cent. Although it is probable that sales of ammonia will continue to expand, the available information indicates that it will be of relatively small consequence compared to the probable increase in output and captive use.

In 1964 the production of ammonia was 669,000 tons and the estimated capacity of Canadian producers was 662,000 tons, indicating that plants were operating essentially at maximum capacity most of the year. By the beginning of 1967 Canadian capacity is likely to be for 2.3 million tons, an addition to the capacity existing in 1964 of 1.6 million tons. About one half of this additional capacity was under construction or completed toward the end of 1965. Thus, if the anticipations of expanded demand are realized, production in 1967 is likely to be of the order of 2 million tons or about treble that of 1964.

As noted earlier, about two thirds of Canadian output of ammonia is for captive use, mainly for the production of nitrogenous fertilizers. In the late 1950's, about 80 per cent or more of the ammonia produced was used in the manufacture of fertilizers; in recent years slightly less than two thirds of the output was used for this purpose. Only a very small proportion of the ammonia used for fertilizers enters trade. For example, in 1962 about 383,000 tons of ammonia were so used, of which only 11,000 tons, roughly three per cent, were purchased by manufacturers.

The manufacture of industrial chemicals and explosives and use by the pulp and paper industry accounts for most of the remaining domestic demand. In 1964 fertilizer use (both captive and purchased) accounted for 62 per cent of Canadian consumption. Estimated consumption for other uses was as follows: explosives and chemicals 8 per cent, pulp and paper 3 per cent, and a variety of other applications the remaining 27 per cent. As is apparent from the tabulation which follows, consumption for uses other than fertilizers is expanding very rapidly. These other uses account for most of the ammonia which enters commercial channels and, therefore, sales of ammonia can be expected to be correspondingly larger as these uses increase. In spite of these increases in sales, however, a very large part of the projected increase in capacity apparently is based on anticipated increased use for fertilizers.

Estimated Consumption of Ammonia, by Principal Industry, 1959-64

Year	Fertilizers	Explosives & Chemicals	Pulp Paper	Other[(a)]	Domestic Disappearance
		- '000 tons -			
1959	312	41	13	24	390
1960	341	44	14	61	460
1961	382	47	14	51	494
1962	383	51	18	127	579
1963	422	54[(b)]	19	153	648
1964	430	56[(b)]	20[(b)]	184	690

(a) Includes mining and smelting, steel mills, petroleum refinery and others
(b) Estimated

Source: Estimated from various publications of D.B.S. and other published data

Foreign Trade

Neither imports nor exports have been of substantial importance in the trade in ammonia. Imports have averaged less than 5,000 tons annually in recent years, valued at approximately $300,000. This compares with total domestic sales estimated at around 200,000 tons annually with a value of about $15 million. Exports of ammonia, as such, also have been a relatively minor part of sales by Canadian producers, although they have generally been larger than imports. The available data suggest export sales of around 9,000 tons annually, valued at about $675,000. All of the known foreign trade in ammonia is with the U.S.A.

However, although foreign trade in ammonia, itself, is unimportant relative to production, use or sales, the products into which ammonia enters are exported and imported in very large quantities. For example, in 1964, an estimated 230,000 tons of ammonia were exported from Canada in the form of various fertilizers and fertilizer materials. At $75 a ton, this ammonia would be valued at about $17.3 million. Imports of fertilizers and fertilizer materials in whose manufacture ammonia is used are also substantial although not nearly so large as exports.

Imports of ammonia are almost entirely into provinces east of Manitoba; most exports were said to be into the states of Washington and Oregon, in the U.S. Pacific Northwest. Until 1962, New Brunswick accounted for a large part of the imports of ammonia.

Imports of Ammonia, by Region of Entry, 1958-64

Year	New Brunswick	Quebec	Ontario	Other	Total	
		- tons -			tons	$'000
1958	6,117	4,821	6,164	43	17,145	1,379
1959	4,320	1,184	84	5	5,593	423
1960	2,162	692	546	-	3,400	260
1961	3,090	1,195	2,451	14	6,750	516
1962	809	399	14	5	1,227	107
1963	235	77	2,930	9	3,252	253
1964	..	..	..	..	30,404	2,143

Source: Dominion Bureau of Statistics, s.c. 8265

Transportation

It is usual to transport ammonia in the liquid state in insulated tank cars or in tank trucks; it is also shipped in cylinders. Transportation costs are substantial. For example, in 1963, the cost of moving a ton of ammonia, by tank car, from Maitland to North Bay, Ontario, a distance of approximately 350 miles, was $11.60, about 14 per cent of the published price of $84 per ton.

Plant location gives domestic producers an advantage in freight cost over foreign competitors in shipping to most of the important consuming centres in Canada. The principal exception occurs at Edmundston, New Brunswick, where the transport costs from the plant at Searsport, Maine gave an advantage to the United States supplier.

Pricing Policy and Prices

In both Canada and the United States, ammonia is ordinarily sold f.o.b. works, freight equalized. This policy applies to both the fertilizer grade (99.5 per cent) and the refrigeration grade which is of higher purity (99.95 per cent). The aqueous solution (aqua ammonia) contains 29.4 per cent ammonia and is priced according to its ammonia content.

Prices of Anhydrous Ammonia, Fertilizer Grade,
Canada and the U.S.A., 1959-64
(per ton, tank cars, at works, freight equalized)

Year	U.S.A.(a)				Canada(b)
	High	Low	High	Low	$Can.
	$U.S.		$Can.(c)		
1959	88	84	84	81	80
1960	92	84	89	81	80
1961	92	84	93	85	84
1962	92	84	98	90	84
1963	92	84	99	91	84
1964	92	84	99	91	84

(a) East of Rocky Mountains
(b) Technical Grade
(c) $U.S. converted to $Can. at annual average noon rate of exchange

Source: Oil, Paint and Drug Reporter; Canadian Chemical Processing

List prices in Canada have been the same as the annual low in the U.S.A., at parity of exchange. However, the decline in the value of Canadian funds relative to the U.S.A. has, since mid-1961, made Canadian ammonia cheaper, expressed in U.S. funds, than the U.S. product. The refrigeration grade was priced at a premium of $2.00 to $2.50 per ton, over the fertilizer grade.

West of the Rockies in the United States, the price of ammonia was said to be about $2.00 a ton less than it is east of the mountains, and one California producer was said to be selling, in 1960, at a price of $U.S. 66 a ton. Cominco sells ammonia in the U.S.A. in competition with these prices. From this and other information available to the Board, it is evident that sales are made below the list prices. In addition, a spokesman for the Ontario producers drew attention to their practice of absorbing freight costs in excess of $10 per ton. This policy was said to have been instituted in an effort to promote the use of ammonia in making sulphite wood pulp.

Tariff Considerations

Ammonia is entered under tariff item 711 at rates of 15 p.c., B.P. and 20 p.c., M.F.N. If it is imported for use in its principal applications it is entered for use as a fertilizer, under item 663 at rates of Free, B.P. and 5 p.c., M.F.N., and, if for use in the manufacture of fertilizers, it is entered under item 663b, free of duty under all Tariffs. As noted below, Polymer Corporation also made mention of entry under item 851, free of duty under all Tariffs if imported for use in the manufacture of synthetic rubber.

All imports of ammonia have been from the United States under the M.F.N. Tariff and most imports in recent years have been entered under item 711. At the public hearing on November 21, 1960, the spokesman for several Canadian manufacturers of ammonia stated that all imports were entitled to duty drawback.(1)

A group of ammonia manufacturers made a joint submission that ammonia should continue to be dutiable at 15 p.c., B.P. and 20 p.c., M.F.N.(2) The companies which made this proposal were:

Brockville Chemicals Limited, Maitland, Ont.
Canadian Industries Limited, Montreal, Que.
Cyanamid of Canada, Limited, Montreal, Que.
Dow Chemical of Canada, Limited, Sarnia, Ont.

The Consolidated Mining and Smelting Company of Canada, Limited, proposed that ammonia for use as a fertilizer, now entered under item 663 at 5 p.c., M.F.N. should be entered free of duty. The company spokesman said:

> "The company does not oppose maintenance of the existing level of duties, but considers that Canada could permit anhydrous ammonia entering Canada as a fertilizer to be admitted duty free in exchange for some reciprocal drop in the United States tariff."(3)

Ammonia is entered into the U.S.A., free of duty, regardless of intended use.

The Canadian Pulp and Paper Association opposed any increase in tariff rates applicable to chemicals used in the pulp and paper industry, including ammonia.(4)

The Canadian Pharmaceutical Manufacturers expressed an interest in ammonia and urged that chemicals which were made in Canada and were used in the manufacture of pharmaceuticals should be dutiable at rates of 15 p.c., B.P. and 20 p.c., M.F.N.(5)

(1) Transcript, Vol. 13, p. 1786
(2) Same, Vol. 13, p. 1779
(3) Same, Vol. 13, p. 1837
(4) Same, Vol. 85, p. 13006
(5) Same, Vol. 87, p. 13321

Polymer Corporation Limited indicated an interest in ammonia and recommended that materials used in the manufacture of synthetic rubber continue to be entered free of duty under all Tariffs in an item worded like existing tariff item 851.(1)

Naugatuck Chemicals Division of Dominion Rubber Company Limited informed the Board that the company took no issue with the rates proposed by the Canadian producers for materials it used provided that the Board also recommended the rates which the company would propose for the products which it manufactured.(2)

The Canadian Federation of Agriculture expressed an interest in ammonia as a constituent of fertilizers and pesticides. The Federation proposed continued free entry under all Tariffs for chemicals so used.(3)

Those who urged the retention of rates of duty of 15 p.c., B.P., 20 p.c., M.F.N., pointed to the benefits to the Canadian economy of having ammonia production in Canada and suggested that the duty had been a factor in the establishment of some plants in Canada. Although imports do not supply an appreciable part of the market in Canada, the manufacturers said there was a threat from imports during the periods of surplus, at times seasonal, in the U.S.A. At such times, Canadian producers might have to resort to price reductions to meet lower quotations in the United States. It was also noted that the existing duty had not resulted in higher prices in Canada than in the U.S.A., and therefore it was claimed that the duty was not injurious to any interests in Canada. The Canadian producers also said that although they were not at a disadvantage with respect to costs of production, their costs of distribution were likely higher than in the U.S.A.

As the foregoing analysis indicates, ammonia is produced in Canada mainly in large scale plants, principally for captive use in the manufacture of fertilizers and industrial chemicals. The total production in Canada, in 1964, was about 670,000 tons of which only about one third entered commerce. Exports ordinarily exceeded imports by a considerable margin although foreign trade in ammonia was of minor significance relative to production, use or sales. Of the approximately 460,000 tons which were used captively in 1964, about one half was exported in the form of various fertilizers or fertilizer materials.

The import data indicate that a large part of the ammonia that was imported was entered in New Brunswick, where users were at a considerable distance from the nearest plants, in Ontario. The data also show that Canadian producers have a freight cost advantage, relative to potential suppliers in the U.S.A., at most consuming centres of significance.

(1) Transcript, Vol. 89, p. 13501
(2) Same, Vol. 6, p. 901
(3) Same, Vol. 83, p. 12813; Vol. 110, p. 16631

The Canadian industry has been undergoing a rapid expansion for several years and is expected to triple its productive capacity, between 1964 and 1967. It is hardly likely that an expansion of such proportions would be undertaken by an industry which was continually threatened by the possibility of imports of surplus product at low prices. Moreover, imports have been a factor of little significance for several years and Canadian prices, expressed in a common currency, have been lower than in the U.S.A., since 1961.

Although the manufacturers' submission gave some support to their request for a tariff of 20 p.c., on imports from M.F.N. countries, they did not indicate why the B.P. Tariff should be 15 p.c., as they proposed. All known foreign trade in ammonia is with the U.S.A. and no imports have been reported from Commonwealth countries.

SODIUM HYDROXIDE (CAUSTIC SODA); POTASSIUM HYDROXIDE (CAUSTIC POTASH); PEROXIDES OF SODIUM OR POTASSIUM - B.T.N. 28.17 AND HYDROGEN PEROXIDE (INCLUDING SOLID HYDROGEN PEROXIDE) - B.T.N. 28.54

INTRODUCTION

Heading 28.17 of the Brussels Tariff Nomenclature is worded as follows, "sodium hydroxide (caustic soda); potassium hydroxide (caustic potash); peroxides of sodium or potassium." Sodium hydroxide is by far the most important of the group but potassium hydroxide and sodium peroxide are also of economic importance.

Sodium hydroxide is produced in Canada as an inevitable co-product of chlorine. Because of the close relationship of their production and distribution, sodium hydroxide (caustic soda) and chlorine are dealt with together in the section dealing with B.T.N. heading 28.01.

Potassium hydroxide and sodium peroxide are discussed separately, followed by hydrogen peroxide of heading 28.54, a product competitive in use with sodium peroxide.

Of the four products classified in heading 28.17, potassium peroxide was the only one which was not the subject of representations. The Industry Committee took the position that products which were not the subject of representations by others should be dutiable at rates of 15 p.c., B.P. and 20 p.c., M.F.N.(1) The Committee did not indicate why these rates would be appropriate specifically for potassium peroxide. The product is not known to be made in Canada and appears to be of negligible commercial significance. Under the existing tariff it is probably entered under tariff item 208t, as an unenumerated chemical of a kind not produced in Canada, at rates of Free, B.P., 15 p.c., M.F.N.

POTASSIUM HYDROXIDE

The Product and the Industry

Potassium hydroxide, caustic potash or lye is a chemical compound which, in the anhydrous form, is white, deliquescent and occurs as pieces, lumps, sticks, pellets or flakes. When dissolved in water it generates heat. It absorbs water and carbon dioxide readily from the air and deteriorates rapidly. It is hazardous to handle, causing severe burns on contact.

It is available commercially in an anhydrous form containing 88 to 92 per cent of potassium hydroxide and as a 45 per cent solution in water. The freezing point of the 45 per cent solution is -25° Fahrenheit and, therefore, unlike caustic soda, tank cars in which the product is shipped do not need to be insulated. For statistical purposes it has been assumed that two tons of 45 per cent solution are equivalent in potassium hydroxide content to one ton of the anhydrous (i.e., 90 per cent) product.

(1) Transcript, Vol. 13, p. 1856

Potassium hydroxide is manufactured by an electrolytic process which is essentially the same as that used in making sodium hydroxide except that potassium chloride is used as the basic raw material instead of sodium chloride. Purification of the potassium chloride brine before electrolysis is an essential part of the process for the successful operation of the electrolytic cells.

Chlorine and hydrogen are co-products of the process of manufacture. For each 2,000 pounds of potassium hydroxide that are produced, there are also produced 1,260 pounds of chlorine and 35 pounds of hydrogen.

As in the production of caustic soda, the storage capacity for the co-product chlorine can be a limiting factor in the production of caustic potash. However, the quantity of caustic potash that is likely to be produced in Canada in the next several years is unlikely to involve production of significant quantities of chlorine.

Potassium hydroxide was not manufactured in Canada until late 1960 when Canadian Industries Limited (C.I.L.) began to produce the 45 per cent solution at Cornwall, Ontario; the company spokesman indicated that it did not plan to manufacture the anhydrous form.(1) The Consolidated Mining and Smelting Company of Canada Limited (Cominco) began production in 1961 at Warfield, British Columbia, principally to supply the company's own requirements for use in the manufacture of liquid fertilizers.(2)

In Canada, potassium hydroxide is produced from potassium chloride imported from Carlsbad, New Mexico. Although Canada has large deposits of potassium chloride (potash) in Saskatchewan only the agricultural grade of potassium chloride is being, or is expected to be, produced. The chemical grade, which is used in the manufacture of potassium hydroxide, is of a higher purity than the agricultural grade and is a very small part of the total consumption. In Canada, the chemical grade is estimated to be less than five per cent of total use and even in the United States, where more extensive use is made of this grade, it constitutes only about five per cent of the total consumption of potassium chloride.(3)

In December 1962, on the basis of published prices, the laid-down cost of potassium chloride at Cornwall was $52.74 per ton, of which the cost of freight was $19.38 and of the material $33.36. At that time, the published selling price of potassium hydroxide was $79.62 a ton. Because about 1,200 pounds of potassium chloride are required to produce one ton of the 45 per cent solution, the delivered cost of the raw material constituted about 40 per cent of the selling price of the finished product. The cost of transporting the raw material to Cornwall was about $11.60 per ton of 45 per cent solution, nearly 15 per cent of its selling price.

The process of manufacturing potassium hydroxide is very similar to that of producing sodium hydroxide. The principal differ-

(1) Transcript, Vol. 14, p. 1980
(2) Same, Vol. 21, p. 3105
(3) Same, Vol. 14, p. 1973

ence is that potassium chloride is used to produce the former while sodium chloride (common salt) is the raw material for the latter. As indicated, the laid-down cost at Cornwall of one ton of potassium chloride was about $52.74 in December 1962; at that time the comparable cost of one ton of sodium chloride was approximately $10. Furthermore, one ton of sodium chloride yields 1,213 pounds of co-product chlorine compared with only 951 pounds from a ton of potassium chloride. Therefore, it is apparent that potassium chloride is not a competitive raw material for the production of chlorine, and that the potassium hydroxide must bear the higher cost of the basic raw material.

At the time of the hearing in 1960, there was a 15 per cent duty on the potassium chloride coming from the United States, but a few months later, on July 3, 1961, the product was granted free entry under temporary item 209e.

Prices of Potassium Chloride[a] in the U.S.A.,
Selected Years, 1956-65

	High	Low	High	Low
	$U.S. per ton		$Can. per ton[b]	
1956	29.00	28.00	28.54	27.55
1960	29.00	28.00	28.12	27.15
1961	31.00	29.00	31.41	29.38
1962	31.00	31.00	33.14	33.14
1963	31.00	31.00	33.43	33.43
1964	33.00	31.00	35.59	35.44
1965	33.00	33.00	35.60	35.60

(a) Chemical grade, 99.9%, bulk, carload lots, at producers' works
(b) Converted to $Can. on basis of annual average, noon, spot rate of exchange

Source: Oil, Paint and Drug Reporter

The Market

Until Canadian Industries Limited began to manufacture potassium hydroxide, 45 per cent solution, at its Cornwall plant, all of Canada's supply was imported, partly as anhydrous caustic potash and partly as the 45 per cent solution. It is estimated that imports in 1960 (and therefore consumption) of potassium hydroxide were about 2,800 tons, anhydrous basis, valued at nearly one-half million dollars. Estimated use in 1960 was around two-thirds more than in 1955, five years previously. More than 40 per cent of consumption in 1960 was of the anhydrous form.

At the public hearing, the C.I.L. spokesman stated that the decision to begin production in Canada was based partly on the expectation of an early expansion of the market for the product. He said:

"It is expected that the use of potassium hydroxide by soap manufacturers will grow as a market for heavy-duty liquid detergents develops, and the designed capacity of the company's plant takes this anticipated demand into account. Potassium hydroxide is not used directly in this class of detergent, but is utilized in the manufacture of potassium phosphates which in turn are used in these detergent formulations. It is understood that the Electric Reduction Company will produce potassium phosphates at Port Maitland, Ontario, when market demand warrants."(1)

Potassium phosphates were not being produced in Canada at the end of 1962.

Although the available statistics do not distinguish between imports of the 45 per cent solution and imports of the anhydrous form, the available information supports the conclusion that only anhydrous potassium hydroxide is imported from Europe.(2) Imports from the U.S.A. consist of both the anhydrous material and the 45 per cent solution. For the analysis which follows, estimates were made of the quantity of each form imported from the U.S.A.

Imports of Potassium Hydroxide, Selected Years, 1953-64

	Anhydrous			45 per cent Solution	Total Imports	
	From Europe	From U.S.A.(a)	Total	From U.S.A.(a)		
	- as tons of anhydrous equivalent -				tons(b)	$'000
1953	335	528	863	655	1,518	246
1955	367	482	849	811	1,660	275
1957	356	277	634	1,509	2,142	350
1959	570	471	1,041	1,601	2,642	428
1960	723	459	1,182	1,614	2,795	450
1961	748	535	1,283	212	1,495	255
1962	462	480	941	359	1,300	222
1963	214	966	1,180	484	1,674	298
1964	163	1,538	1,701	62	1,763	337

(a) Estimated
(b) Anhydrous equivalent

Source: Derived from D.B.S., Trade of Canada, Imports, s.c. 8327

The effect of C.I.L.'s entry into production is apparent in the above table. Until 1960, imports had been increasing steadily; in 1961, the first year that C.I.L. was in operation, imports declined by almost 50 per cent. There was also an abrupt change in the relative importance of the anhydrous form. Domestic production of the solution tended to displace imports of that form in the principal market areas. As a result, imports of the anhydrous form, which had been from one-third to one-half of the total (anhydrous equivalent), increased in

(1) Transcript, Vol. 14, p. 1975
(2) Same, Vol. 14, p. 1976

relative importance and, in the four years 1961-64, were an estimated 82 per cent of the smaller imports.

The available data regarding consumption of potassium hydroxide by individual industries are incomplete, suggesting that a large part of the use is in amounts not sufficiently large to be tabulated separately. According to these data the soap and detergent industry, the largest single user of caustic potash in Canada, accounted for about one-half of the total consumption until 1960.

The major use of potassium hydroxide by this industry is in household bar soaps, soft soaps and liquid soap formulations. Potassium hydroxide increases the solubility of soap in hard water and improves its lathering quality. It is also a component of bleaches and enters indirectly into the manufacture of liquid detergents. The increased use of potassium hydroxide has been mainly due to larger consumption by the soap and detergent industry. From 1955 to 1960, total use rose by 1,135 tons, of which 866 tons or 76 per cent was by this industry.

The chemical industry consumes potassium hydroxide in the manufacture of oxalic acid and other potassium compounds; the oil refining industry uses it in the production of aviation gasolines; the synthetic rubber industry uses it in the course of producing synthetic rubber. The product is also used in the manufacture of storage batteries and liquid fertilizers. The Consolidated Mining and Smelting Company of Canada indicated that its production of potassium hydroxide was principally for the latter purpose.

Either the anhydrous or the liquid form of the product would be suitable for most of the applications cited above. However, only the anhydrous form can be used in some applications such as the manufacture of batteries. Potassium hydroxide is an important material in the production of both primary batteries (non-rechargeable) and the Edison-type of rechargeable storage batteries in which the chemical reaction begins when water is added to the anhydrous caustic potash in the cells.

Consumption of Potassium Hydroxide in Canada, by Industry, Selected Years, 1952-62

	Soaps and Detergents	Other Chemical Products	Other Uses[a]	Total Consumption
	- as tons of anhydrous equivalent -			
1953	590	437	491	1,518[b]
1955	551	455	654	1,660[b]
1957	1,038	388	716	2,142[b]
1959	1,156	373	1,113	2,642[b]
1960	1,417	720	658	2,795[b]
1961	1,235	1,481	284	3,000[c]
1962	873	908	1,219	3,000[c]

(a) "Total Consumption" less listed uses
(b) Imports into Canada
(c) Estimated

Source: D.B.S., various publications and Trade of Canada, Imports, s.c. 8327

Until 1961, approximately three-quarters of total imports and, therefore, consumption of potassium hydroxide was in the region east of Manitoba; the remaining 25 per cent was mainly in British Columbia and Alberta, where it is used largely by oil refineries.(1) Ontario is the major market area for the product. The spokesman for C.I.L. estimated that about 50 per cent of the total Canadian use occurred in the Toronto-Hamilton area, where the soap and detergent industry is concentrated.(2)

Estimated Imports of Potassium Hydroxide, Basis Anhydrous Equivalent, by Region of Entry, Selected Years, 1953-63

	East of Manitoba		Manitoba and West		Canada	
	tons	$'000	tons	$'000	tons	$'000
1953	1,330	214	187	32	1,518	246
1955	1,243	207	416	68	1,660	275
1957	1,724	280	418	69	2,142	350
1959	2,094	329	548	100	2,642	428
1960	1,989	314	806	135	2,795	450
1961	1,099	191	395	63	1,495	255
1962	1,066	185	223	38	1,300	222
1963	1,326	233	332	66	1,674	298

Source: Derived from D.B.S., s.c. 8327

Potassium hydroxide in solution is hazardous and costly to transport and a relatively large amount must be purchased at one time in order to obtain the economy of tank car prices. As a result, the solution is usually purchased by consumers who use large quantities of the product and who are located at relatively short distances from a supplier; others are more likely to use the anhydrous form. The latter form can be purchased in smaller quantities to be used as needed, an important convenience to some users and the cost of freight is appreciably lower because the anhydrous form is approximately twice as concentrated as the 45 per cent solution.

East of Manitoba the 45 per cent solution became an increasing proportion of the total consumption between 1953 and 1960. In 1953, the solution was only about one-half the total supply in this region; in 1960, it was three-quarters of the total. West of Ontario, the anhydrous form was more commonly used; two-thirds to three-quarters of the purchases in that period were in this form.

The U.S.A. has been the principal source of Canadian imports of potassium hydroxide, supplying from 65 per cent to almost 90 per cent of the total in most years. Germany and France were also regular sources of supply but all other countries combined have normally supplied only about one per cent of the total.

(1) Transcript, Vol. 14, p. 1975
(2) Same, Vol. 14, p. 1977

Estimated Imports of Potassium Hydroxide, Basis Anhydrous Equivalent, by Region and by Type of Product, Selected Years, 1953-63

	East of Manitoba			Manitoba and West		
	Anhydrous	45% Solution	Anhydrous as % of Total	Anhydrous	45% Solution	Anhydrous as % of Total
	as tons anhydrous		%	as tons anhydrous		%
1953	701	629	53	161	26	86
1955	608	636	49	241	175	58
1957	449	1,275	26	184	234	44
1959	637	1,457	30	404	144	74
1960	618	1,371	31	563	243	70
1961	903	196	82	377	18	96
1962	697	370	65	222	1	100
1963	817	509	62	332	-	100

Source: Derived from D.B.S., s.c. 8327

Estimated Imports of Potassium Hydroxide, by Country of Origin, Selected Years, 1953-64

	Country of Origin				Total Imports	U.S.A. as % of Total
	U.S.A.	France	West Germany	Others		
	- as tons of anhydrous equivalent -					%
1953	1,183	85	231	19	1,518	78
1955	1,292	52	295	20	1,660	78
1957	1,786	194	125	37	2,142	83
1959	2,072	278	245	46	2,642	78
1960	2,073	305	409	8	2,795	74
1961	747	297	276	174	1,495	50
1962	839	255	136	71	1,300	64
1963	1,460	78	114	23	1,674	87
1964	1,600	-	130	33	1,763	91

Source: Derived from D.B.S., Trade of Canada, Imports, s.c. 8327

In 1961, Canadian production of potassium hydroxide began to displace imports of the solution. For that year total imports were only 1,495 tons compared with 2,795 tons in 1960, the decrease being entirely accounted for by the decline of imports of the solution. Imports of the anhydrous product from the U.S.A. appear to have been unaffected by Canadian production.

Initially, imports from Europe appeared to have been unaffected by Canadian production and in 1961 were about the same as in 1960. However, they declined after 1961 and in 1964 were only 163 tons, less than one-quarter of their volume in 1960. Imports of anhydrous potassium hydroxide, which in 1960 had constituted 42 per cent of total imports, averaged 82 per cent of the much smaller total importations in the period 1961-64.

Pricing Policy and Prices

In the United States prices of potassium hydroxide are quoted f.o.b. plant, freight equalized. For the anhydrous form the quotations are for the product in drums, in carload lots, basis 88 to 92 per cent potassium hydroxide content; for the solution, prices are quoted on the basis of 45 per cent potassium hydroxide content. These are the usual commercial forms. Because about two tons of the 45 per cent solution would have to be shipped to equal one ton of 88 to 92 per cent potassium hydroxide, transportation costs will be much higher if the required potassium hydroxide content is obtained in solution.

At the public hearing, the spokesman for C.I.L. stated that two grades of potassium hydroxide solution are available in the U.S.A., the product of greater purity selling, in 1960, at a premium of $5 a ton. He added that:

> "The company [C.I.L.] manufactures only the high quality material which it sells at the price of the lower grade United States product."[1]

Prices of Potassium Hydroxide in the U.S.A., Selected Years, 1953-65

	45 Per Cent Solution[a]	Regular Flake[b]	45 Per Cent Solution	Regular Flake
	$U.S. per ton		$Can. per ton[c]	
1953	71-74	170-183	70-73	167-180
1957	74-79	183-195	71-76	175-187
1959	74	183	71	175
1960	74	183-191	72	177-185
1961	74	191	75	194
1962	74	191	79	204
1963	74	191	80	206
1964	74	191	80	206
1965	74	201	80	217

(a) Tank cars, at works
(b) 88-92% potassium hydroxide, drums, carload lots, at works
(c) Converted to $Can., basis annual average, noon, spot rate of exchange

Source: Oil, Paint and Drug Reporter

C.I.L. sells the 45 per cent solution in tank cars, tank trucks and drums; tank truck shipments can be made in quantities as small as 1,500 gallons and drums are available f.o.b. Toronto and Montreal. Prices are quoted in U.S. currency, f.o.b. works at Cornwall, Ontario, payable in Canadian funds. The delivered price is equalized against competing producers in the U.S.A.

(1) Transcript, Vol. 14, p. 1976-7

Transportation

As stated earlier, the cost of transportation is an important factor both in producing and in marketing potassium hydroxide. In December 1962, freight constituted more than one-third of the laid-down cost of the principal raw material, potassium chloride, at the Cornwall plant. Because the Canadian manufacturers intended to produce only the 45 per cent solution and about one ton of water would have to be shipped for every ton of potassium hydroxide contained, costs of shipping are also an important factor in marketing the finished product.

The bulk of the central Canadian market is in south-western Ontario, particularly the Toronto-Hamilton area, where the soap and detergent industry is concentrated. Sales are also made to other parts of southern Ontario and Quebec. For the 45 per cent solution, the competition in this entire region is mainly from plants at Niagara Falls and Syracuse, New York.[1] In 1962, C.I.L. had a freight advantage in the eastern part of the Ontario-Quebec region, but freight costs from Niagara Falls, N.Y., were lower than those from Cornwall, Ontario, to most of south-western Ontario, including the important Toront-Hamilton area. The company is also at a substantial freight cost disadvantage in British Columbia, amounting in the coastal region to more than 30 per cent of the selling price of the 45 per cent solution.

Potassium Hydroxide Solution, Freight Rates[a]
from Cornwall, Ontario and Competitive U.S.A. Locations,
to Selected Consuming Centres in Canada,
June, 1964

Destination	Rate from Cornwall $/ton	From U.S.A. Rate $/ton	From U.S.A. Origin	Canadian Advantage(+) or Disadvantage(-) $/ton
Varennes, Que.	5.60	15.00	Syracuse, N.Y.	+9.40
Montreal, Que.	5.00	14.80	Syracuse, N.Y.	+9.80
Ottawa, Ont.	5.00	11.40	Syracuse, N.Y.	+6.40
Toronto, Ont.	8.00	5.60	Niagara Falls, N.Y.	-2.40
Hamilton, Ont.	8.00	4.60	Niagara Falls, N.Y.	-3.40
London, Ont.	16.20	6.20	Niagara Falls, N.Y.	-10.00
Winnipeg, Man.	30.00	36.40	Niagara Falls, N.Y.	+6.40
Ioco, B.C.	56.20	29.60	Pittsburgh, Calif.	-26.60
Shellburn, B.C.	56.20	29.60	Pittsburgh, Calif.	-26.60

(a) In tank cars or tank trucks

Source: Agreed charges and correspondence with transportation companies

(1) Transcript, Vol. 170, p. 27959

Tariff Considerations

Potassium hydroxide is entered under tariff items 209a(1) and 209a(2).

	British Preferential Tariff	Most-Favoured-Nation Tariff
Item 209a		
Potash, pearl ash and caustic potash:-		
1. When in packages of not less than twenty-five pounds weight each	Free	Free
2. When in packages of less than twenty-five pounds weight each	10 p.c.	$12\frac{1}{2}$ p.c.

At the public hearing in November 1960, the spokesman for Canadian Industries Limited proposed that potassium hydroxide be dutiable at rates of 15 p.c., B.P. and 20 p.c., M.F.N.(1)

Naugatuck Chemicals Division of Dominion Rubber Company Limited supported these rates conditional on the acceptance of recommendations which it would present for chemicals produced by Naugatuck.(2)

Three soap manufacturers, Canada Packers Limited, Lever Brothers Limited and Swift Canadian Limited, informed the Board that they took no issue with the proposed rates. Their position was qualified in the following terms:

> "we do not now object to the rates of 15 per cent B.P. and 20 per cent M.F.N. which are proposed for potassium hydroxide and sodium hydroxide. This is not intended to imply that the soap companies are, or would be, indifferent to price increases in these important alkalis. We would hope and expect that the manufacturers would not take undue advantage of any additional duty to raise the price of these alkalis, but rather would use the tariff principally to maintain a sufficient differential between delivered costs of Canadian and foreign alkali in Canada to assure maximum use of the Canadian-made product."(3)

Polymer Corporation Limited indicated its interest in potassium hydroxide, for which it proposed that the end-use provisions of tariff item 851 be continued.(4) The company's purchases of potassium hydroxide, if imported, would be free of duty under that item.

The Canadian Manufacturers of Chemical Specialties Association opposed any change in the existing rates.(5)

(1) Transcript, Vol. 14, p. 1971
(2) Same, Vol. 6, p. 899-900
(3) Same, Vol. 13, p. 1901
(4) Same, Vol. 89, p. 13587
(5) Same, Vol. 14, p. 1999

Cipel (Canada) Limited, in a letter to the Tariff Board dated April 17, 1961, subsequent to the public hearing, opposed the application of a duty on the anhydrous form. Cipel manufactures batteries in which it uses the flake form of potassium hydroxide.

The Canadian Pulp and Paper Association strongly opposed any increase in duties for chemicals used by its members.(1)

Consolidated Mining and Smelting Company of Canada Limited, which, at the time of the hearing, was preparing to enter into the production of potassium hydroxide, urged that no change be made in the existing rates of duty for chemicals such as would increase the costs of Canadian manufactures.(2)

In a letter to the Board dated July 29, 1960, Electric Reduction Company of Canada Limited expressed its interest in potassium hydroxide and proposed rates of 15 p.c., B.P. and 20 p.c., M.F.N.

The Canadian Pharmaceutical Manufacturers Association also indicated its interest in the product and urged rates of 15 p.c., B.P. and 20 p.c., M.F.N., when they are made in Canada, for chemicals used in the manufacture of pharmaceuticals.(3)

Thus, there were two sets of proposals before the Board. The principal Canadian manufacturer proposed that potassium hydroxide, in all forms and sizes of packages, be dutiable at rates of 15 p.c., B.P. and 20 p.c., M.F.N. This proposal was supported by a group of consumers, some of whom qualified their support as noted earlier. Another group of interests urged free entry for the product under both the B.P. and M.F.N. Tariffs.

Almost all of the potassium hydroxide which has been imported has originated in countries not entitled to the British preference and only a negligible quantity has been entered under tariff item 209a(2). Thus, the significant tariff item is 209a(1) which provides for free entry under all Tariffs. The proposal of C.I.L. would increase the effective rate from free entry to 20 p.c., the M.F.N. rate, and would eliminate the differences in rates for imports in packages weighing less than 25 pounds and those in larger packages. At prices current in the U.S.A. in mid-1965, this would involve a duty of $16 per ton for the 45 per cent solution and of $41.20 per ton for the anhydrous flake.

In support of the rates of duty proposed, the smaller scale of operations and higher landed costs of potassium chloride were cited by the C.I.L. spokesman as disadvantages of the Cornwall plant relative to competitors in the U.S.A.

At the time of the hearing the raw material, potassium chloride, was subject to a duty of 15 per cent; since then temporary item 209e, which provides for free entry of the material, has been inserted in the Customs Tariff. As a result, the difference between the deli-

(1) Transcript, Vol. 85, p. 13006
(2) Same, Vol. 5, p. 715
(3) Same, Vol. 87, p. 13321

vered cost at Cornwall and at the two major competitive U.S. locations, Niagara Falls and Syracuse, New York, is due to differences in the costs of transportation from Carlsbad, New Mexico, where the product originates. In March 1962, in terms of a ton of 45 per cent solution, the disadvantage was $1.34 per ton relative to Niagara Falls and 75 cents per ton relative to Syracuse, less than two per cent of the selling price of the 45 per cent solution at that time.

In the years 1956-60, about 75 per cent of the Canadian market for potassium hydroxide was estimated to be in Ontario and Quebec. Of the average annual consumption in this area of about 1,900 tons, more than 80 per cent was imported from the U.S.A. and the remainder from Europe. The Canadian product, if priced according to the statements made at the hearing, can be delivered in most of this region at a lower price than the U.S. product.

However, the proximity of plants in the U.S.A. to Toronto and Hamilton, the major market area in Ontario, could be an important competitive factor in marketing the Canadian product. If the Canadian manufacturer continues to sell his product at the U.S. price in equivalent Canadian funds, this is the one area in Canada where differences in transportation costs might give rise to serious competition from U.S. suppliers. Relative to the plants at Niagara Falls, New York, the Canadian producer has a small freight disadvantage on the raw material and a somewhat larger freight disadvantage in shipping the finished product to the Hamilton-Toronto area. Taking both into account, the apparent disadvantage to the Canadian manufacturer in selling in this important market area was equivalent to approximately five per cent of the selling price at the end of 1962.

Freight costs on the 45 per cent solution from Cornwall to British Columbia are such that the product might very well continue to be imported in spite of rates of duty of the order of those proposed by the Canadian producer. At the hearing, the spokesman for Canadian Industries Limited stated:

> "It is the belief of the company that a duty of 20% M.F.N. and an f.o.b. plant selling price comparable with that prevailing in the United States will enable the company to capture the market. Admittedly, this may not be true at those destinations in British Columbia and Alberta where potassium hydroxide is used."(1)

Imports of potassium hydroxide directly into the Atlantic Provinces averaged only about 7.4 tons per year in the period 1956-60 (before Canadian production was available). However, imports into Western Canada, particularly into British Columbia and Alberta, were substantial. In the five years 1956-60, annual imports into Western Canada averaged 547 tons per year and constituted about 22 per cent of total Canadian consumption.

Without a tariff on imports, the entire western region could purchase with advantage from suppliers in the U.S.A.; with a 20 per cent rate of duty the Cornwall plant might be able to compete with

(1) Transcript, Vol. 14, p. 1981

potassium hydroxide from the United States in Manitoba and part of Saskatchewan, but would still be at a disadvantage in the much more important market areas of Alberta and British Columbia. Apart from the production of the Consolidated Mining and Smelting Company, which was planned mainly for captive use, the imposition of a tariff would tend to raise the cost of the material to Canadian consumers in this market area.

The proposed duty would be applicable on both the liquid and anhydrous forms of the product. To some degree the anhydrous forms are used because of economy of transportation. However, as Cipel indicated, for some purposes only the anhydrous forms can be used and the tariff protection sought by C.I.L. would increase the cost of these materials to such users even though these forms are not made in Canada. In July 1965, the price of anhydrous flake in the U.S.A. was $Can. 206 a ton. A 20 per cent duty at this price amounts to $Can. 41.20 a ton, a substantial increase in cost to users who have no Canadian source of supply of this particular material.

The spokesman for C.I.L. claimed that there was a "disparity in the rates of customs duty" applying to potassium hydroxide and sodium hydroxide. The former was entered free of duty while most imports of the latter were dutiable at 17½ p.c., M.F.N.(1) In mid-1965, the published price of 45 per cent potassium hydroxide was $80 a ton compared with about $28 a ton for a corresponding concentration of sodium hydroxide. The much higher cost of the former would make the area of substitutability very limited.

SODIUM PEROXIDE

Sodium peroxide enters commercial trade as a free-flowing granular product which contains not less than 96 per cent of sodium peroxide.(2) It is ordinarily supplied in drums in which it can be stored safely and transported easily. When dissolved in water, sodium peroxide yields hydrogen peroxide and sodium hydroxide. This ability to form hydrogen peroxide when dissolved in water gives the product valuable bleaching properties.

As a bleach and in other lesser applications, sodium peroxide is directly competitive with hydrogen peroxide. The principal difference between using a solution of sodium peroxide or using hydrogen peroxide for bleaching is that a solution of the former is more alkaline than a solution of the latter. However, the degree of alkalinity or acidity of either solution can be adjusted easily by the addition of either acid or alkali, although this may involve some loss of convenience in use and some additional cost. The solution may also be 'standardized' in some applications by using a mixture of sodium and hydrogen peroxide.

Sodium peroxide is used mainly as a bleach for pulp and paper. The Canadian Pulp and Paper Association reported a total use of 500,000 pounds by its members in 1959, about 60 per cent of Canadian

(1) Transcript, Vol. 14, p. 1981
(2) Same, Vol. 14, p. 2017

use. In the bleaching of pulp the product was said to have a small advantage over hydrogen peroxide because of the more alkaline solution.[1] The spokesman for Du Pont of Canada Limited estimated that 92 per cent of the use of the product was for bleaching pulp and textiles and about eight per cent for miscellaneous applications such as the bleaching of flour and as a laboratory reagent.

Sodium peroxide is not produced in Canada and all supplies are imported, mainly from the U.K. but with substantial amounts also originating in the U.S.A. Since 1953, the U.K. has displaced the U.S.A. as the major supplier of the Canadian market. Imports have been declining since 1956, and in 1963 were 485,000 pounds, valued at $76,000.

In addition, in 1963 there were imports of about 140,000 pounds of hydrogen peroxide (100 per cent basis) valued at $59,000, mostly from Austria.

Imports of Sodium Peroxide by Country of Origin, Selected Years, 1953-63

	U.K.	U.S.A.	Other	Total	
		thousand pounds		'000 lb.	$'000
1953	-	657	38(a)	695	123
1956	615	432	16(a)	1,063	156
1959	557	300	-	856	138
1960	390	124	-	514	80
1961	456	75	-	531	83
1962	388	33	71(b)	492	74
1963	365	93	27(b)	485	76

(a) From Western Germany
(b) From France

Source: D.B.S., Trade of Canada, Imports, s.c. 8358

Sodium peroxide supplies only a small proportion of the peroxides used in Canada. One pound of commercial sodium peroxide is equivalent to approximately 0.42 pounds of 100 per cent hydrogen peroxide. In 1960, the combined use of sodium and hydrogen peroxide is estimated to have been equal to 2.7 million pounds of 100 per cent hydrogen peroxide; sodium peroxide accounted for just under eight per cent of the total at that time. Moreover, the Canadian use of hydrogen peroxide has been increasing in recent years while the use of sodium peroxide has been relatively stable. As a result, it is unlikely that sodium peroxide has supplied more than five per cent of total Canadian use in the last few years. Hydrogen peroxide is discussed in the accompanying part of the report dealing with B.T.N. heading 28.54

(1) Transcript, Vol. 14, p. 2005

Sodium peroxide, when entered free of duty (from the U.K.), appears to be a somewhat cheaper source of hydrogen peroxide than Canadian-produced hydrogen peroxide. In the tabulation below, the unit values of imports have been converted to a basis of 100 per cent hydrogen peroxide equivalence (assuming no waste). No allowance has been made for transportation costs in bringing the material from the U.K. to the consuming point in Canada, but this cost is likely to be generally less than the difference between the average value of the imported sodium peroxide and the list price shown in the tabulation for Canadian hydrogen peroxide. The data also indicate why the U.K. has replaced the U.S.A. as the principal source of sodium peroxide.

	Unit Value of Imports of Sodium Peroxide		Price of Canadian
	U.S.A.(a)	U.K.(b)	Hydrogen Peroxide(c)
	cents per lb. of 100% hydrogen peroxide		
1959	47.6	33.3	56.0
1960	50.0	33.3	56.0
1961	54.8	33.3	51.4
1962	59.5	35.7	51.4
1963	50.0	33.3	51.4
1964	..	..	51.4
1965	..	..	51.4

(a) Excludes freight and duty of 12½ p.c.
(b) Excludes freight from port of origin
(c) Delivered in Ontario and Quebec

Source: Derived from Trade of Canada, Imports, s.c. 8358 and Canadian Chemical Processing

The substitutability of sodium and hydrogen peroxide was discussed at some length at the public hearing and raised the question as to whether there was any cost advantage in using a mixture of sodium peroxide and hydrogen peroxide instead of using either hydrogen peroxide or sodium peroxide separately to achieve the desired results in bleaching pulp. The spokesman for Du Pont calculated that if the two peroxides were used as a mixture, the cost per ton of pulp would be $8.28 compared with $9.08 per ton of pulp if either hydrogen peroxide or sodium peroxide were used separately. The savings by using the mixture of peroxides would amount to 80 cents per ton of pulp, or approximately 10 per cent of the peroxide cost.

Tariff Considerations

Sodium peroxide is enumerated in tariff item 210 as "peroxide of soda" and is entered under this item at rates of Free, B.P. and 12½ p.c., M.F.N.

At the public hearing in November 1960, Du Pont of Canada Limited proposed that the chemical be entered at rates of 15 p.c., B.P. and 20 p.c., M.F.N., the same rates that would be proposed at a later hearing for hydrogen peroxide.(1)

(1) Transcript, Vol. 14, p. 2005

At the same hearing, Imperial Chemical Industries Limited, the British supplier of the Canadian market, urged that so long as sodium peroxide was not made in Canada the existing rates under item 210 be continued. The spokesman for I.C.I. said his company would not object to rates of 15 p.c., B.P. and 20 p.c., M.F.N. when sodium peroxide was ruled to be made in Canada.(1)

At a later hearing, the Canadian Pulp and Paper Association strongly opposed any increase in the rates of duty for chemicals used by its members. The Association expressed an interest in sodium peroxide and reported a use of 500,000 pounds of sodium peroxide by its members in 1959, about 60 per cent of the total Canadian consumption.(2)

No other representations were made to the Board related specifically to sodium peroxide.

Thus, there were two proposals before the Board. That of Du Pont would increase the B.P. Tariff from the existing free entry to 15 p.c. and would increase the M.F.N. rate from $12\frac{1}{2}$ p.c. to 20 p.c. The proposals of Imperial Chemical Industries and the Canadian Pulp and and Paper Association would leave unchanged the existing rates under tariff item 210, though the I.C.I. proposal allowed for a possible increase if sodium peroxide is made in Canada.

In support of his company's proposed increase in rates, the spokesman for Du Pont said:

> "The fundamental case for a tariff on sodium peroxide relates directly to the fact that in its major commercial uses it is completely interchangeable with hydrogen peroxide, with some added caustic soda ... In practical purpose sodium peroxide and hydrogen peroxide are practically identical chemicals and for this reason it is proposed that the tariff treatment should be the same for each."(3)

The Canadian market for these peroxides has been expanding rapidly, and all of the increased use has been supplied by hydrogen peroxide. Since 1959, when the second Canadian producer of hydrogen peroxide (Du Pont) came into operation, imports of sodium peroxide have declined from about 850,000 pounds to about 500,000 pounds in 1963. Currently, sodium peroxide is estimated to represent about five per cent of Canadian use in terms of 100 per cent hydrogen peroxide.

Although sodium peroxide and hydrogen peroxide are generally substitutable for each other in bleaching applications, this is not ordinarily a direct substitution but involves the use of other chemicals. To substitute the sodium for the hydrogen peroxide may involve disadvantages in convenience and cost. In a simplified example that the spokesman for Du Pont cited at the hearing, the use of hydrogen peroxide would involve an additional cost of 10 per cent in the bleaching process.

(1) Transcript, Vol. 14, p. 2017
(2) Same, Vol. 85, p. 13006
(3) Same, Vol. 14, p. 2001

It is important to note that commercial sodium peroxide is not directly comparable, pound for pound, with commercial hydrogen peroxide. One pound of sodium peroxide in its usual commerical form contains about 0.42 pounds of 100 per cent hydrogen peroxide (the usual basis of comparison for bleaching). Thus, if sodium peroxide is to be compared with hydrogen peroxide, the comparison should take into account the hydrogen peroxide equivalence of the sodium peroxide and the concentration of the hydrogen peroxide with which it is being compared. The most common commercial strengths of hydrogen peroxide are concentrations of 35 per cent and 50 per cent.

In 1964, the price of sodium peroxide, f.o.b. plant, in the U.S.A., was 21.5 cents a pound and the price of hydrogen peroxide, 35 per cent concentration, was 17 cents a pound delivered. Ignoring the freight cost covered by the latter price, in terms of 100 per cent hydrogen peroxide, the sodium peroxide would cost 51.2 cents a pound and the hydrogen peroxide 48.6 cents a pound.

In 1963, the average value of imports of sodium peroxide from the U.K. (the major supplier) was 14 cents a pound, or 33.3 cents a pound in terms of 100 per cent hydrogen peroxide. The list price of Canadian-produced hydrogen peroxide, 50 per cent concentration, was 25.7 cents a pound at that time or 51.4 cents a pound, delivered, in terms of a 100 per cent solution. A similar price relationship has existed for some years. From this, it would appear that, even if an allowance is made for overseas freight cost and delivery to point of use in Canada, the cost of imported sodium peroxide would be somewhat lower than that of the Canadian hydrogen peroxide. However, in spite of this apparent lower cost, the use of sodium peroxide has been declining in relation to the use of hydrogen peroxide, indicating that other factors outweigh any price advantage that might exist. From the foregoing, it seems doubtful that "equivalent" rates for the two products would necessarily be uniform rates. Nor is it clear why an increase in rates of duty is necessary at a time when imported sodium peroxide is a declining share of the Canadian requirements for peroxide bleaching.

Imperial Chemical Industries Limited argued that there are still many products for which the market in Canada is too small to warrant domestic manufacture and cited sodium peroxide as one. The spokesman for I.C.I. urged that:

> "The imposition of a protective duty such as is now proposed [15 p.c., B.P. and 20 p.c., M.F.N.] would result in the Canadian customer paying a higher price for material which has been purchased from I.C.I. for many years, and to which he has become accustomed ... It [I.C.I.] considers that the effect of this [the imposition of rates of 15 p.c., B.P. and 20 p.c., M.F.N.] would simply be to increase the cost of sodium peroxide from all sources to the Canadian consumer, while at the same time reducing the margin of preference on a U.K. export to Canada which appears to have been of benefit to both countries."(1)

(1) Transcript, Vol. 14, p. 2016-8

The Canadian Pulp and Paper Association strongly opposed any increase in rates for sodium peroxide on the grounds that higher rates of duty on chemicals used by its members would have an adverse effect on costs. The spokesman for the Association referred to the high degree of competition, particularly in export markets, for products of the pulp and paper industry and claimed that higher costs would make these products less competitive in foreign markets, even though export sales would be eligible for drawback of duty.

HYDROGEN PEROXIDE (INCLUDING SOLID HYDROGEN PEROXIDE) B.T.N. 28.54

The Product and the Industry

Hydrogen peroxide is available commercially as a colourless liquid or, in combination with urea, as a solid known as urea peroxide. It is usually sold in concentrations of 35 and 50 per cent by weight of hydrogen peroxide but it is also available in concentrations as low as three per cent, for pharmaceutical use, and as high as 90 per cent for use as a propellant in missiles. When it is put up as a pharmaceutical preparation it is classified in the B.T.N. under heading 30.03.

The principal uses of hydrogen peroxide are as a bleach for pulp and paper and textiles and in the epoxidation of soybean oil for the production of vinyl resins. It has lesser applications in the manufacture of foam rubber, toiletries and pharmaceuticals. In its use as a bleach for pulp and paper and textiles, hydrogen peroxide competes with sodium peroxide and to a lesser extent with other bleaching products. For use in epoxidation, the product has no known substitute.

At the public hearing on sodium peroxide, considerable emphasis was placed on the degree of substitutability of sodium peroxide and hydrogen peroxide. When sodium peroxide is added to water, a reaction occurs in which hydrogen peroxide and sodium hydroxide are formed. The presence of the sodium hydroxide makes the solution somewhat alkaline. When hydrogen peroxide is added to water, the resulting solution is more acidic. However, the discussion at the hearing on sodium peroxide in November 1960, indicated that in many applications it would make little technical difference whether sodium peroxide or hydrogen peroxide was used. Even where an alkaline solution is desirable, hydrogen peroxide can be used if an alkali, for example sodium hydroxide, is added to achieve the degree of alkalinity that is wanted. Similarly, the addition of an acid to a solution of sodium peroxide will yield the degree of acidity that might be desired.

The necessity of regulating the alkalinity or acidity of the solution might affect the convenience or cost of using one or other of the two chemicals. However, either sodium peroxide or hydrogen peroxide when added to water will yield a solution of hydrogen peroxide and technically such solutions would have identical properties in their principal applications when their alkalinity or acidity is appropriately adjusted.

Hydrogen peroxide is produced by two principal processes, one chemical, the other electrolytic. Both processes are used in Canada, the chemical process is used by Du Pont of Canada Limited at Maitland, Ontario and the electrolytic process, by Canadian Industries Limited at Hamilton, Ontario. C.I.L. began the production of hydrogen peroxide at Shawinigan, Quebec, in 1934 and produced at this site until 1958 when the Hamilton plant began operations. Until 1959, when Du Pont began operations, C.I.L. was the only Canadian company which produced hydrogen peroxide.

The chemical process was said to have gained considerable popularity after the Second World War when a German process in which quinone is used became widely known. It was said that the simplicity and economy of this process had led to a great expansion of European and North American productive capacity. In fact, it was claimed that this expansion had led to surplus capacity in most industrialized countries of the world.

The Market

At the hearing on hydrogen peroxide the spokesman for Du Pont estimated that, in 1960, the Canadian market absorbed the equivalent of about 2.5 million pounds of 100 per cent hydrogen peroxide. Most of the product would be purchased in concentrations of 35 and 50 per cent of hydrogen peroxide. In 1960, at the published price for the 50 per cent solution this quantity of hydrogen peroxide would have a value of about $1.5 million, delivered to bulk consumers. The Canadian market for the product was said to be growing fairly rapidly so that it is probable that in 1964, Canada consumed about three million pounds (100 per cent basis) with a delivered value, at the lower price which existed in that year, of only a little more than $1.5 million.

Most of the increase in Canadian demand which developed in the 1950's was said to have arisen with the introduction of automatic equipment for continuous bleaching of textiles and, in the late 1950's, from the additional use by the chemical industry. In textile bleaching, hydrogen peroxide has been displacing sodium hypochlorite.

The rapid growth of the Canadian market is shown by the following estimates made by a trade journal. The imports, which are also shown in this table, have been converted to a basis of 100 per cent hydrogen peroxide.

Estimated Production, Consumption and Imports of Hydrogen Peroxide, Selected Years, 1954 - 64

	Consumption	Imports[a]	Production[b]
	'000 lb., 100 per cent basis		
1954	800	260	540
1955	1,000	680	320
1956	1,700	1,100	600
1957	2,000	1,400	600
1958	2,200	250	1,950
1959	2,350	400	1,950
1960	2,500[c]	170	2,330
1963	3,000[d]	140	2,900
1964	3,100[d]	100	3,000

(a) Assumes imports from Europe as 35% concentration and imports from U.S.A. as 50% concentration
(b) Estimated consumption minus imports
(c) Estimated by Du Pont, Transcript, Vol. 33, p. 4806
(d) Estimated by Tariff Board

Source: Canadian Chemical Processing, July 1960, p. 34; September 1963, p. 64; D.B.S., Trade of Canada, Imports, s.c. 8373

Most of the market for hydrogen peroxide is in Ontario, Quebec and the Atlantic Provinces, with Ontario and Quebec consuming the largest amount because of the heavy concentration of textile, pulp and paper and chemical plants in these two provinces. However, hydrogen peroxide is used throughout Canada.

As noted previously, from 1934 to 1959, C.I.L. was the only producer in Canada. Until 1957, the company supplied the market from its plant at Shawinigan, Quebec; in 1958, production was transferred to the new plant at Hamilton, Ontario. During the latter part of the period the company had insufficient capacity to supply the total demand. Du Pont, whose plant came into full operation in 1959, had been supplying Canadian customers with hydrogen peroxide which the company imported from the U.S.A. At the public hearing it was said that C.I.L. and Du Pont, together, accounted for a large part of Canadian imports.

Until 1957, the great bulk of the imports was from the U.S.A.; imports from European countries were irregular and generally negligible in comparison with imports from the U.S.A. In 1957, just before C.I.L.'s new plant came into operation, imports reached a peak of 2.8 million pounds, equivalent to an estimated 1.4 million pounds, basis 100 per cent hydrogen peroxide.

Since 1957, imports from the U.S.A. have declined to less than 50,000 pounds annually and total imports to between 300,000 and 400,000 pounds annually. Since 1960, Austria has been the principal supplier of the very much smaller imports. In recent years, imports of hydrogen peroxide have been less than approximately five per cent of estimated Canadian consumption.

In addition to the imports of hydrogen peroxide, there have have been imports of about 500,000 pounds of sodium peroxide in recent years, mostly from the U.K. These would be equivalent to approximately 200,000 pounds of hydrogen peroxide, 100 per cent basis.

Imports of Hydrogen Peroxide, by Principal Country of Origin, Selected Years, 1948 - 64

	U.S.A.	Austria	Other	Total	
		'000 lb.		'000 lb.	$'000
1948	489	-	-	489	76
1951	352	14	98	564	128
1955	1,263	-	142	1,405	315
1957	2,791	-	22	2,813	598
1959	780	13	1	794	232
1960	186	131	85	402	89
1961	35	257	54	346	56
1962	31	241	21	293	50
1963	42	347	-	389	59
1964	39	241	-	280	44

Note: These data are not converted to 100 per cent basis

Source: D.B.S., Trade of Canada, Imports, s.c. 8373

In Canada and the U.S.A., hydrogen peroxide is sold in tank cars and tank trucks and in 270 pound drums, mainly in concentrations of either 35 per cent or 50 per cent. Imports from Europe are mainly in a 35 per cent strength, the maximum permitted by ocean shipping regulations. Imports from Europe are in carboys which contain about 150 pounds of 35 per cent product.

Canadian prices for hydrogen peroxide are on the basis of delivery to the buyer and include the return freight for empty drums on quantity purchases. However, these delivered prices are not uniform across the country; they vary regionally and are related to the cost of freight from the point of production to the warehousing point at which regional prices are quoted. In the U.S.A., hydrogen peroxide is also sold on a delivered basis.

A comparison of prices in Canada and in the U.S.A. indicates that list prices in Canada were substantially higher than in the U.S.A. from 1956 until 1960. In 1961 Canadian prices were lowered to $25.70 a hundredweight, the price in the U.S.A. at that time. Published Canadian prices have been unchanged since 1961; United States prices were reduced in 1963.

Prices of Hydrogen Peroxide, 50 per cent Concentration, in Tanks, Delivered, in Canada and the U.S.A., 1956 - 64

	Canada $ per cwt.	U.S.A.(a) $U.S. per cwt.
1956	29.65	25.70
1957	29.75	25.70
1958	28.00	25.70
1959	28.00	25.70
1960	28.00	25.70
1961	25.70	25.70
1962	25.70	25.70
1963	25.70	24.28
1964	25.70	24.28

(a) Converted from published price of 35% solution

Source: Canadian Chemical Processing; Oil, Paint and Drug Reporter; Transcript, Vol. 33, p. 4819

Tariff Considerations

Hydrogen peroxide is entered under tariff items 219(i) and 219(ii).

	British Preferential Tariff	Most-Favoured-Nation Tariff
Item 219(i)		
Solutions of peroxides of hydrogen, n.o.p.	$12\frac{1}{2}$ p.c.	$22\frac{1}{2}$ p.c.
Item 219(ii)		
Solutions of hydrogen peroxide containing twenty-five per centum or more by weight of hydrogen peroxide	Free	$22\frac{1}{2}$ p.c.

The Explanatory Notes to the Brussels Nomenclature (page 225) for heading 28.54 state that, "The present heading also includes solid hydrogen peroxide (hydrogen peroxide combined with urea), whether or

not stabilised." The Notes also state that, "Hydrogen peroxide is very unstable in an alkaline medium, especially when exposed to heat or light. It nearly always contains small amounts of stabilisers ... to prevent decomposition; such mixtures remain within this heading."

At the time of the hearing, in March 1961, the stabilized product was classified in heading 28.54, but the inclusion of the solid hydrogen peroxide in this heading occurred after the hearing. At the time of the hearing the solid was classified in heading 38.19.

In the administration of the Canadian Customs Tariff, the solid forms would be classified under existing tariff item 208t with rates of Free, B.P. and 15 p.c., M.F.N.; the stabilized solutions would be entered under item 219.

No representations were made to the Board relating to either the stabilized solutions or the solid forms. Virtually all imports have been from M.F.N. countries and the duty collected on these indicates that most have been entered as solutions at 22½ p.c., the M.F.N. rate under tariff items 219(i) and 219(ii).

At the public hearing in March 1961, Canadian Industries Limited and Du Pont of Canada Limited made a joint submission to the Board in which they urged that hydrogen peroxide be dutiable at rates of 15 p.c., B.P. and 20 p.c., M.F.N., under an item worded like heading 28.54 of the Brussels Tariff Nomenclature.(1)

The Canadian Pulp and Paper Association strongly opposed any increase in rates for hydrogen peroxide.(2)

The Canadian Pharmaceutical Manufacturers Association listed hydrogen peroxide as a product of minor economic importance to its members. The Association proposed that chemicals made in Canada and used in the manufacture of pharmaceuticals should be subject to rates of 15 p.c., B.P. and 20 p.c., M.F.N.(3)

No other representations were made which related specifically to hydrogen peroxide.

From the evidence given at the public hearing and other available information it is apparent that solutions of hydrogen peroxide which contain less than 25 per cent by weight of hydrogen peroxide do not ordinarily enter trade. Thus, tariff item 219(ii) would apply to virtually all imports. The proposal of the Canadian producers would, therefore, increase the effective B.P. rate from the existing free entry to 15 p.c. and would decrease the M.F.N. rate from 22½ per cent to 20 per cent.

In support of their proposal the two Canadian producers said that Canadian productive capacity was in excess of Canadian use and that there was a serious threat to their market from excess production in Europe particularly from Austria. Their spokesman said that in making their proposal:

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(1) Transcript, Vol. 33, p. 4800
(2) Same, Vol. 33, p. 4863; Vol. 85, p. 13006
(3) Same, Vol. 87, p. 13321

"The fundamental premise is that the Canadian manufacturer must have the entire Canadian market in order to achieve an economic level of sales.

"The economics of hydrogen peroxide are such that the final increment of sales is crucial to total profitability."(1)

He also referred to foreign competition from "low wage and salary areas" and the substitutability of other chemicals, particularly sodium peroxide. He said that many European countries gave special concessions to companies which exported chemical products and that this made it even more difficult for Canadian producers to compete.

In the years immediately preceding the establishment of new facilities in Canada, capacity to produce hydrogen peroxide was far less than domestic use and imports increased sharply, reaching a total of 2.8 million pounds in 1957, about two thirds of the estimated Canadian consumption in that year. The discussion indicated that a large proportion of the imports was brought in by C.I.L. and Du Pont.

In 1958, the new plant of C.I.L., at Hamilton, came into operation. According to trade reports, when plans for this new plant were first announced, its productive capacity was said to be designed to supply the whole Canadian market. At that time (1956) Canada was using about 1.5 million pounds of hydrogen peroxide (100 per cent basis) and the market was expanding rapidly. The first year in which the new plant was in operation, imports dropped very sharply, from 2.8 million pounds in 1957 to about 0.5 million pounds in 1958, suggesting that imports had been required to supplement domestic production.

In 1956, the Canadian price for bulk shipments was $29.65 and in 1957 it was $29.75 per hundredweight, 17 to 21 per cent higher than corresponding prices in the U.S.A., yet virtually all imports were from the U.S.A. With the increase in output at Hamilton, in 1958, the Canadian price was lowered from $29.75 a hundredweight to $28 a hundredweight.

In 1958, at about the time that C.I.L. announced its plans to build the new plant at Hamilton, Du Pont also announced its plans to build a plant at Maitland, Ontario. The magazine "Canadian Chemical Processing" commented as follows, in the issue of July, 1960:

"About eighteen months ago, headlining an article on the Canadian market for hydrogen peroxide, CCP [Canadian Chemical Processing] asked Too Much Bleach?

"The answer was yes. There would be too much bleach if both C-I-L and Du Pont went ahead with projected plants - each, according to definite statements, big enough to supply the entire Canadian market."

(1) Transcript, Vol. 33, p. 4796

Thus, it was apparent that if the two new plants were to share the existing Canadian market neither could expect to operate near capacity for some years unless substantial quantities of the chemical were exported. The discussion at the hearing indicated that the plants were built in anticipation of further market growth. It was expected that as the market grew the new plants would gradually approach the level of output for which they were designed. The Du Pont plant began production in 1959 and it is noteworthy that about a year later, in 1960, C.I.L. announced that it would expand the Hamilton plant although Canadian capacity at that time was presumably far in excess of Canadian demand.

In 1961, with the Du Pont plant in operation and presumably also with the expansion of the C.I.L. plant completed, the Canadian price for bulk hydrogen peroxide was lowered to $25.70 a hundredweight, the price in effect in the U.S.A. at that time. With the opening of the Du Pont plant, imports from the U.S.A. fell from 780,000 pounds in 1959 to 186,000 pounds in 1960. After 1960, annual imports from the U.S.A. declined to less than 50,000 pounds. From 1961 to 1964, the Canadian price remained unchanged at $25.70 a hundredweight; the price in the U.S.A. was reduced in 1963, from $25.70 to $24.28 a hundredweight (for the 50 per cent solution, in tank cars).

From 1960 to 1964, imports from all countries, other than Austria, were negligible. Imports from Austria began to enter Canada regularly in 1959, and in 1963, were 347,000 pounds (probably at 35 per cent concentration). This represented a substantial increase in imports from Austria; relative to the estimated Canadian use of three million pounds or more (100 per cent concentration) in that year these imports represented less than five per cent of the total use.

From the foregoing it appears that, until 1959, hydrogen peroxide was imported mainly because there was insufficient Canadian product to supply the demand. Since 1959, imports have been a very minor part of Canadian supplies and have been largely from one country, Austria.

During the whole post-war period, imports from the U.K. have been irregular and of negligible proportions. It is difficult to see, on the basis of past imports, how the position of Canadian producers might be improved by increasing the B.P. rate from the existing free entry under item 219(ii) to 15 p.c., as proposed.

At the public hearing, the two companies placed considerable emphasis on the low prices being quoted by European producers and claimed that these arose from such factors as subsidization of exports and more particularly from the overexpansion of hydrogen peroxide productive capacity in Europe. For example a submission by Du Pont claimed that in 1960 the Canadian and United States prices per pound (100 per cent basis) in drums were 57.8 cents compared with corresponding prices in Germany of 30.8 cents and in Austria of 36.0 cents a pound. The corresponding prices, laid down at Montreal, were said to be 50.0 cents a pound for imports from Germany, 56.4 cents for those from Austria and 70.8 cents for imports from the U.S.A. According to these data, a Canadian consumer would have had to pay 14.4 cents more per pound for the United States product than for the Austrian product and 20.8 cents a pound more than for the German

product. In spite of this, imports from the U.S.A., in 1960, were approximately equal to the imports from Germany and Austria combined, and total imports were less than half the quantity imported in 1959 (100 per cent basis). Imports continued their decline in 1961.

The two companies spoke of the very high degree of substitutability of sodium peroxide in most bleaching applications in which hydrogen peroxide is used. Imports of sodium peroxide, a product which is not produced in Canada, reached a peak of about one million pounds in 1956 and then declined gradually. The decline was more rapid after 1959 when Du Pont's hydrogen peroxide plant came into operation; from 1960 to 1963, imports of sodium peroxide were relatively stable at approximately 500,000 pounds per year.

The Canadian Pulp and Paper Association supported its opposition to any increase in existing rates in various submissions made to the Board. In general, the Association took the position that chemicals used in the production of pulp and paper were a substantial item of cost to the industry. The spokesman for the Association said that additional costs arising out of increased rates of duty on chemicals used by its members would make Canadian pulp and paper less competitive in world markets. He indicated that exports were a very important part of the industry's business and therefore he strongly urged that there be no increase in the rates of duty for chemicals used in the production of pulp and paper, even though drawback of duty could be claimed on the portion used in products that were exported.

The Canadian Pharmaceutical Association did not indicate why rates of 15 p.c., B.P. and 20 p.c., M.F.N. would be appropriate specifically for hydrogen peroxide, but took the view generally that chemicals made in Canada should receive protection.

APPENDIX I

Statistical Tables

Imports

Exports

Table 1

Imports: Salt for the use of the sea or gulf fisheries, s.c. 7297[a]

Tariff Item 40

Year	Total Imports ton	$ (000)	Unit Value $/cwt.
	1. Total		
1953	60,121	369	.31
1954	58,745	316	.27
1955	49,621	300	.30
1956	58,985	330	.28
1957	75,474	292	.19
1958	56,977	247	.22
1959	63,789	258	.20
1960	65,100	261	.20
1961	60,515	256	.21
1962	47,672	181	.19
1963	66,835	304	.23
1964	45,665	225	.25
	2. United States		
1953	3,168	15	.23
1954	2,168	10	.23
1955	2	*	1.95
1956	300	4	.59
1957	8	*	1.44
1958	1,550	8	.25
1959	-	-	-
1960	500	5	.47
1961	550	2	.19
1962	2,793	11	.20
1963	2,212	8	.19
1964	350	2	.22
	3. Jamaica		
1953	2,346	22	.46
1954	6,148	21	.17
1955	5,702	29	.25
1956	4,147	15	.18
1957	3,072	10	.16
1958	5,223	27	.26
1959	5,032	18	.17
1960	4,297	16	.18
1961	550	2	.20
1962	4,521	15	.17
1963	5,578	22	.20
1964	350	2	.22

Table 1
(Cont'd)

Year	Total Imports ton	Total Imports $ (000)	Unit Value $/cwt.
	4. Bahamas		
1953	31,690	138	.22
1954	22,449	89	.20
1955	10,888	59	.27
1956	12,264	42	.17
1957	14,379	66	.23
1958	25,259	102	.20
1959	32,029	121	.19
1960	24,827	100	.20
1961	3,808	19	.25
1962	3,920	21	.26
1963	18,985	128	.34
1964	10,516	59	.28
	5. Spain		
1953	20,619	155	.38
1954	23,179	146	.31
1955	29,769	200	.34
1956	41,564	264	.32
1957	51,331	191	.19
1958	24,922	111	.22
1959	26,607	118	.22
1960	35,313	137	.19
1961	55,361	228	.21
1962	36,376	132	.18
1963	39,970	144	.18
1964	34,449	164	.24

(a) Beginning in 1964 renumbered as s.c. 279-68

Table 2

Imports: Salt, n.o.p., in bags, barrels and other coverings, s.c. 7299(a)

Tariff Item 41

Year	Total Imports ton	Total Imports $ (000)	Unit Value $/cwt.	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			1. Total			
1953	36,362	531	.73	373	20,198	5.4
1954	40,841	519	.64	366	23,740	6.5
1955	36,017	437	.61	343	22,363	6.5
1956	17,961	285	.79	250	11,580	4.6
1957	17,527	282	.80	250	11,398	4.6
1958	16,445	275	.84	238	10,293	4.3
1959	14,625	239	.82	212	9,239	4.4
1960	10,170	203	1.00	195	6,821	3.5
1961	10,992	229	1.04	221	7,782	3.5
1962	11,015	234	1.06	220	7,672	3.5
1963	11,148	266	1.19	252	11,364	4.5
			2. United Kingdom			
1953	7,505	158	1.05	-	-	-
1954	6,942	153	1.10	-	-	-
1955	4,056	94	1.16	-	-	-
1956	1,435	35	1.23	-	-	-
1957	1,251	32	1.27	-	-	-
1958	1,741	37	1.07	-	-	-
1959	1,427	27	.96	-	-	-
1960	337	6	.94	-	-	-
1961	351	7	.96	-	-	-
1962	338	7	1.05	-	-	-
1963	336	7	1.07	-	-	-
			3. United States			
1953	28,856	373	.65	373	20,198	5.4
1954	33,899	366	.54	366	23,740	6.5
1955	31,499	338	.54	338	22,040	6.5
1956	16,526	250	.76	250	11,580	4.6
1957	16,276	250	.77	250	11,398	4.6
1958	14,704	238	.81	238	10,293	4.3
1959	13,198	212	.80	212	9,239	4.4
1960	9,833	197	1.00	195	6,821	3.5
1961	10,641	222	1.04	221	7,782	3.5
1962	10,677	227	1.06	220	7,672	3.5
1963	10,812	259	1.20	252	11,364	4.5

(a) Beginning in 1964 included in s.c. 279-70

Table 3

Imports: Salt in bulk, n.o.p., s.c. 7298[(a)]

Tariff Item 42

Year	Total Imports tons	Total Imports $ (000)	Unit Value $/cwt.	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			1. Total			
1953	210,826	1,115	.26	994	109,108	11.0
1954	270,802	1,309	.24	1,232	149,517	12.1
1955	279,578	1,127	.20	1,024	150,513	14.7
1956	242,133	963	.20	874	132,213	15.1
1957	274,385	1,039	.19	939	148,533	15.8
1958	267,423	946	.18	913	154,991	17.0
1959	291,378	1,018	.17	980	168,620	17.2
1960	115,919	321	.14	287	63,770	22.3
1961	126,485	437	.17	401	70,350	17.5
1962	185,961	608	.16	566	105,266	18.6
1963	254,598	1,011	.20	972	147,338	15.2
1964	359,909	1,706	.24	1,657	229,217	13.8
			2. United States			
1953	203,574	1,071	.26	977	107,227	11.0
1954	270,802	1,309	.24	1,232	149,517	12.1
1955	279,578	1,127	.20	1,024	150,513	14.7
1956	242,133	963	.20	874	132,213	15.1
1957	248,116	971	.20	911	139,022	15.3
1958	223,789	898	.20	865	128,810	14.9
1959	205,778	911	.22	874	117,260	13.4
1960	41,082	231	.28	197	18,869	9.6
1961	62,291	357	.29	322	31,833	9.9
1962	85,870	485	.28	443	45,212	10.2
1963	155,335	892	.29	852	87,781	10.3
1964	199,595	1,501	.38	1,456	133,155	9.1
			3. Mexico			
1953-56	-	-	-	-	-	-
1957	11,148	12	.05	12	6,689	56.3
1958	43,635	48	.06	48	26,181	54.0
1959	82,240	97	.06	97	49,344	50.8
1960	74,837	90	.06	90	44,901	50.1
1961	64,194	79	.06	79	38,517	48.5
1962	100,091	123	.06	123	60,054	48.8
1963	99,263	120	.06	120	59,557	49.8
1964	160,110	201	.06	201	96,062	47.9

(a) Beginning in 1964 renumbered as s.c. 279-70 which includes former s.c. 7299

Table 4

Imports: Salt, table, made by an admixture of other ingredients, when containing not less than 90% of pure salt, s.c. 7296[(a)]

Tariff Item 42a

Year	Total Imports ton	Total Imports $ (000)	Unit Value $/cwt.	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			1. Total			
1953	24	2	4.82	2	231	10.0
1954	24	8	16.25	8	772	10.0
1955	39	20	25.13	20	1,968	10.0
1956	45	28	31.74	28	2,828	10.0
1957	97	36	18.74	36	3,557	9.8
1958	41	34	41.63	34	3,434	10.0
1959	175	63	17.92	63	6,380	10.2
1960	751	56	3.73	56	5,457	9.7
1961	1,373	122	4.45	122	12,192	10.0
1962	1,188	98	4.12	98	12,021	12.3
			2. United States			
1953	24	2	4.82	2	231	10.0
1954	24	8	16.25	8	772	10.0
1955	39	20	25.13	20	1,968	10.0
1956	45	28	31.74	28	2,828	10.0
1957	82	35	21.31	35	3,484	10.0
1958	41	34	41.63	34	3,434	10.0
1959	175	63	17.92	63	6,380	10.2
1960	705	53	3.75	53	5,303	10.0
1961	1,353	122	4.50	122	12,174	10.0
1962	1,178	98	4.14	98	12,013	12.3

(a) Beginning in 1963 included in s.c. 599, "Food preparations n.o.p."

Table 5

Imports: Sulphur or brimstone, crude, or in roll or flour, s.c. 7300[a]

Tariff Items 208 and 851

Year	Total Imports ton	Total Imports $ (000)	Unit Value $/ton	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			1. Total			
1953	359,105	8,527	23.74	-	-	-
1954	310,127	7,816	25.20	-	-	-
1955	373,373	9,387	25.14	-	-	-
1956	474,117	11,858	25.01	-	-	-
1957	416,930	9,752	23.39	-	-	-
1958	375,331	8,324	22.18	-	-	-
1959	332,430	6,925	20.83	86	17,119	20.0
1960	328,765	6,629	20.16	90	18,036	20.0
1961	329,556	7,094	21.53	64	12,811	20.0
1962	195,089	4,638	23.77	-	-	-
1963	150,637	3,505	23.27	-	-	-
1964	149,567	3,475	23.23	55	8,604	15.6
			2. United Kingdom			
1953-55	-	-	-	-	-	-
1956	1	*	138.00	-	-	-
1957-58	-	-	-	-	-	-
1959	1	*	338.00	-	-	-
1960	7	*	32.14	-	-	-
1961-64	-	-	-	-	-	-
			3. United States			
1953	359,105	8,527	23.74	-	-	-
1954	310,127	7,816	25.20	-	-	-
1955	373,373	9,387	25.14	-	-	-
1956	472,976	11,832	25.02	-	-	-
1957	416,930	9,752	23.39	-	-	-
1958	374,201	8,297	22.17	-	-	-
1959	327,614	6,834	20.86	86	17,119	20.0
1960	328,743	6,627	20.16	90	18,036	20.0
1961	329,480	7,088	21.51	64	12,811	20.0
1962	194,988	4,629	23.74	-	-	-
1963	150,579	3,500	23.24	-	-	-
1964	149,527	3,471	23.21	55	8,604	15.6

Table 5
(Cont'd)

Year	Total Imports ton	Total Imports $ (000)	Unit Value $/ton	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			4. France			
1953-59	-	-	-	-	-	-
1960	15	2	118.20	-	-	-
1961	76	6	84.95	-	-	-
1962	100	8	84.56	-	-	-
1963	58	6	95.95	-	-	-
1964	40	4	92.05	-	-	-
			5. Mexico			
1953-55	-	-	-	-	-	-
1956	1,140	26	22.59	-	-	-
1957	-	-	-	-	-	-
1958	1,130	27	24.13	-	-	-
1959	4,815	90	18.78	-	-	-
1960-64	-	-	-	-	-	-

(a) Beginning in 1964 renumbered as s.c. 279-77

Table 6

Imports: Chlorine, liquid, or chlorine gas, s.c. 8303[a]

Tariff Items 208t and 711

Year	Total Imports lb. (000)	Total Imports $ (000)	Unit Value $/lb.	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			1. Total			
1953	40,824	1,129	.03	1,121	223,911	20.0
1954	64,275	1,811	.03	1,799	359,811	20.0
1955	75,979	2,159	.03	2,130	425,907	20.0
1956	68,395	1,950	.03	1,938	387,668	20.0
1957	67,657	1,917	.03	1,900	378,753	19.9
1958	46,204	1,311	.03	1,298	259,543	20.0
1959	53,167	1,492	.03	1,465	293,054	20.0
1960	55,639	1,558	.03	1,548	309,548	20.0
1961	59,373	1,714	.03	1,706	341,210	20.0
1962	64,957	1,973	.03	1,973	445,382	22.6
1963	69,104	2,136	.03	2,136	441,003	20.6
1964	85,697	2,616	.03	2,616	523,044	20.0
			2. United States			
1953	40,824	1,129	.03	1,121	223,911	20.0
1954	64,275	1,811	.03	1,799	359,811	20.0
1955	75,979	2,159	.03	2,130	425,907	20.0
1956	68,395	1,950	.03	1,938	387,668	20.0
1957	67,657	1,917	.03	1,900	378,753	19.9
1958	46,204	1,311	.03	1,298	259,543	20.0
1959	53,167	1,492	.03	1,465	293,054	20.0
1960	55,639	1,558	.03	1,548	309,548	20.0
1961	59,373	1,714	.03	1,706	341,210	20.0
1962	64,957	1,973	.03	1,973	445,382	22.6
1963	69,104	2,136	.03	2,136	441,003	20.6
1964	85,697	2,616	.03	2,616	523,044	20.0

(a) Beginning in 1964 renumbered as s.c. 400-03

Table 7

Imports: Soda, caustic, n.o.p., s.c. 8350 [a]

Tariff Items 210a1 and 210a2

Year	Total Imports lb. (000)	Total Imports $ (000)	Unit Value $/lb.	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			1. Total			
1953	8,171	351	.04	347	26,574	7.6
1954	13,027	515	.04	491	38,411	7.8
1955	18,789	711	.04	658	48,625	7.4
1956	31,836	1,152	.04	1,068	92,209	8.6
1957	15,919	624	.04	584	47,110	8.1
1958	7,477	382	.05	346	22,855	6.6
1959	6,776	357	.05	338	20,707	6.1
1960	4,839	265	.05	230	14,290	6.2
1961	4,528	275	.06	192	12,303	6.4
1962	4,345	254	.06	149	12,287	8.3
1963	3,482	227	.07	110	8,513	7.7
1964	4,439	275	.06	165	9,780	5.9
			2. United Kingdom			
1953	455	13	.03	13	910	6.8
1954	844	30	.04	30	2,009	6.7
1955	5,988	187	.03	186	11,948	6.4
1956	595	22	.04	22	1,190	5.4
1957	91	4	.05	4	181	4.4
1958	84	3	.04	3	167	4.8
1959	77	3	.04	3	155	5.1
1960	87	4	.05	4	174	4.4
1961	112	5	.05	5	218	4.4
1962	216	11	.05	11	534	4.8
1963	101	3	.03	3	201	7.7
1964	72	2	.03	2	144	7.4

Table 7
(Cont'd)

Year	Total Imports lb. (000)	Total Imports $ (000)	Unit Value $/lb.	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			3. United States			
1953	7,683	332	.04	328	25,565	7.8
1954	12,144	478	.04	455	36,285	8.0
1955	12,720	512	.04	459	36,433	7.9
1956	31,199	1,123	.04	1,039	90,894	8.7
1957	15,789	615	.04	575	46,810	8.1
1958	7,328	371	.05	336	22,493	6.7
1959	6,638	345	.05	325	20,368	6.3
1960	4,666	252	.05	219	13,975	6.4
1961	4,360	261	.06	180	11,927	6.6
1962	4,063	233	.06	127	11,554	9.1
1963	3,319	214	.06	96	8,126	8.5
1964	4,302	262	.06	153	9,445	6.2

(a) Beginning in 1964 renumbered as s.c. 402-06

Table 8

Imports: Soda, caustic, in solution, s.c. 8352 [(a)]

Tariff Item 210c

Year	Total Imports lb. (000)	Total Imports $ (000)	Unit Value $/lb.	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			1. Total			
1953	158,614	2,004	.01	1,999	349,862	17.5
1954	237,510	3,004	.01	3,004	525,646	17.5
1955	255,709	3,410	.01	3,356	587,368	17.5
1956	233,101	3,081	.01	3,044	532,698	17.5
1957	181,046	2,355	.01	2,296	401,782	17.5
1958	107,994	1,525	.01	1,476	258,375	17.5
1959	130,338	1,746	.01	1,739	304,232	17.5
1960	155,767	2,014	.01	2,010	351,773	17.5
1961	139,372	1,855	.01	1,855	324,697	17.5
1962	203,557	2,957	.01	2,957	518,329	17.5
1963	303,410	4,346	.01	4,346	759,653	17.5
1964	212,010	5,478	.03	5,478	954,690	17.4
			2. United States			
1953	158,614	2,004	.01	1,999	349,862	17.5
1954	237,504	3,003	.01	3,003	525,577	17.5
1955	255,709	3,410	.01	3,356	587,368	17.5
1956	233,101	3,081	.01	3,044	532,698	17.5
1957	181,046	2,355	.01	2,296	401,782	17.5
1958	107,994	1,525	.01	1,476	258,375	17.5
1959	130,338	1,746	.01	1,739	304,232	17.5
1960	155,767	2,014	.01	2,010	351,773	17.5
1961	139,372	1,855	.01	1,855	324,697	17.5
1962	203,557	2,957	.01	2,957	518,329	17.5
1963	296,027	4,295	.01	4,295	751,458	17.5
1964	205,262	5,328	.03	5,328	931,947	17.5

(a) Beginning in 1964 renumbered as s.c. 402-05

Table 9

Imports: Bromine, and bromides, crude, for the production of bromine, s.c. 8301[(a)]

Tariff Items 208 and 208w2

Year	Total Imports lb. (000)	Total Imports $ (000)	Unit Value $/lb.	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			1. Total			
1953	11	4	.41	-	-	-
1954	27	10	.36	-	-	-
1955	32	15	.46	-	-	-
1956	26	11	.40	-	-	-
1957	19	13	.69	-	-	-
1958	17	11	.62	-	-	-
1959	66	25	.38	-	-	-
1960	70	26	.37	-	-	-
1961	62	26	.42	1	210	15.0
1962	35	14	.39	-	-	-
1963	39	15	.38	-	-	-
			2. United States			
1953	11	4	.41	-	-	-
1954	27	10	.36	-	-	-
1955	32	15	.46	-	-	-
1956	26	11	.40	-	-	-
1957	19	13	.70	-	-	-
1958	17	11	.63	-	-	-
1959	66	25	.38	-	-	-
1960	70	26	.37	-	-	-
1961	62	26	.42	1	210	15.0
1962	35	14	.39	-	-	-
1963	39	15	.37	-	-	-

(a) Beginning in 1964 included in s.c. 400-99 worded "Chemical elements n.e.s."

Table 10

Imports: Iodine, crude, s.c. 8304 (a)

Tariff Item 208

Year	Total Imports lb. (000)	Total Imports $ (000)	Unit Value $/lb.	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			1. Total			
1953	115	186	1.63	-	-	-
1954	102	122	1.19	-	-	-
1955	112	154	1.37	-	-	-
1956	102	140	1.37	-	-	-
1957	93	100	1.08	-	-	-
1958	81	77	.96	-	-	-
1959	112	100	.89	1	138	15.5
1960	83	76	.92	-	-	-
1961	244	270	1.11	-	-	-
1962	151	169	1.12	-	-	-
1963	240	249	1.04	-	-	-
1964	179	218	1.22	31	4,605	15.0
			2. United States			
1953	105	172	1.65	-	-	-
1954	24	28	1.17	-	-	-
1955	94	128	1.36	-	-	-
1956	83	115	1.39	-	-	-
1957	43	47	1.10	-	-	-
1958	35	36	1.03	-	-	-
1959	17	16	.93	1	138	15.5
1960	24	22	.95	-	-	-
1961	17	19	1.07	-	-	-
1962	10	12	1.20	-	-	-
1963	8	10	1.22	-	-	-
1964	16	40	2.55	27	4,111	15.1

Table 10
(Cont'd)

Year	Total Imports lb. (000)	Total Imports $ (000)	Unit Value $/lb.	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			3. Chile			
1953	10	14	1.39	-	-	-
1954	78	93	1.20	-	-	-
1955	18	26	1.42	-	-	-
1956	20	26	1.30	-	-	-
1957	50	53	1.06	-	-	-
1958	19	17	.93	-	-	-
1959	61	55	.91	-	-	-
1960	45	42	.94	-	-	-
1961	116	129	1.11	-	-	-
1962	72	85	1.17	-	-	-
1963	42	50	1.18	-	-	-
1964	3	3	1.13	-	-	-
			4. Japan			
1953-57	-	-	-	-	-	-
1958	26	24	.90	-	-	-
1959	34	28	.84	-	-	-
1960	14	12	.81	-	-	-
1961	66	70	1.06	-	-	-
1962	68	72	1.05	-	-	-
1963	190	189	1.00	-	-	-
1964	159	172	1.08	-	-	-

(a) Beginning in 1964 renumbered as s.c. 400-08

Table 11

Imports: Black, carbon, s.c. 8182[a]

Tariff Item 239

Year	Total Imports lb. (000)	Total Imports $ (000)	Unit Value $/lb.	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			1. Total			
1953	57,376	3,718	.06	–	–	–
1954	39,065	2,463	.06	–	–	–
1955	46,693	3,041	.07	–	–	–
1956	42,401	2,604	.06	–	–	–
1957	40,185	2,613	.07	–	–	–
1958	31,286	2,184	.07	–	–	–
1959	39,364	2,691	.07	–	–	–
1960	27,758	2,069	.07	*	15	20.3
1961	20,547	1,682	.08	–	–	–
1962	26,564	2,108	.08	*	12	19.7
1963	27,014	2,141	.08	2	406	17.6
			2. United Kingdom			
1953-54	–	–	–	–	–	–
1955	1	*	.12	–	–	–
1956	36	11	.31	–	–	–
1957	40	8	.20	–	–	–
1958	53	10	.19	–	–	–
1959	2	*	.22	–	–	–
1960	–	–	–	–	–	–
1961	–	–	–	–	–	–
1962	5	1	.12	–	–	–
1963	8	1	.13	–	–	–
			3. United States			
1953	57,376	3,718	.06	–	–	–
1954	39,064	2,463	.06	–	–	–
1955	46,673	3,038	.07	–	–	–
1956	42,365	2,593	.06	–	–	–
1957	40,145	2,605	.06	–	–	–
1958	31,233	2,174	.07	–	–	–
1959	39,362	2,690	.07	–	–	–
1960	27,758	2,069	.07	*	15	20.3
1961	20,547	1,682	.08	–	–	–
1962	26,559	2,107	.08	*	12	19.7
1963	26,982	2,134	.08	2	406	17.6

(a) Beginning in 1964 included in s.c. 400-25

Table 12

Imports: Black, lamp, s.c. 8180 [a]

Tariff Item 239

Year	Total Imports lb. (000)	Total Imports $ (000)	Unit Value $/lb.	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			1. Total			
1953	274	48	.18	-	-	-
1954	229	40	.17	-	-	-
1955	231	41	.18	-	-	-
1956	211	42	.20	-	-	-
1957	200	40	.20	-	-	-
1958	231	48	.21	-	-	-
1959	247	47	.19	-	-	-
1960	134	27	.20	-	-	-
1961	178	38	.21	-	-	-
1962	208	44	.21	1	200	19.9
1963	203	38	.19	1	179	19.9
			2. United Kingdom			
1953	-	-	-	-	-	-
1954	-	-	-	-	-	-
1955	1	*	.40	-	-	-
1956	-	-	-	-	-	-
1957	9	1	.08	-	-	-
1958	7	1	.08	-	-	-
1959	-	-	-	-	-	-
1960	-	-	-	-	-	-
1961	-	-	-	-	-	-
1962	-	-	-	-	-	-
1963	-	-	-	-	-	-

Table 12
(Cont'd)

Year	Total Imports lb. (000)	Total Imports $ (000)	Unit Value $/lb.	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			3. United States			
1953	274	48	.18	-	-	-
1954	229	40	.17	-	-	-
1955	230	41	.18	-	-	-
1956	197	40	.20	-	-	-
1957	179	38	.21	-	-	-
1958	213	46	.21	-	-	-
1959	235	46	.19	-	-	-
1960	123	26	.21	-	-	-
1961	178	38	.21	-	-	-
1962	208	44	.21	1	200	19.9
1963	203	38	.19	1	179	19.9

(a) Beginning in 1964 included in s.c. 400-25

Table 13

Imports: Acetylene black, carbon black and lamp black, s.c. 400-25[a]

Tariff Item 239

Year	Total Imports lb. (000)	Total Imports $ (000)	Unit Value $/lb.	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			1. Total			
1964	23,864	2,075	.09	8	1,643	20.0
			2. United Kingdom			
1964	32	4	.11	-	-	-
			3. United States			
1964	23,832	2,072	.09	8	1,643	20.0

(a) Prior to 1964 included in s.c. 8180 and 8182

Table 14

Imports: Phosphorus and compounds thereof, n.o.p., s.c. 8378[a]

Tariff Item 208p

Year	Total Imports lb. (000)	Total Imports $ (000)	Unit Value $/lb.	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			1. Total			
1953	43	12	.28	10	1,969	20.0
1954	162	31	.19	17	3,423	20.0
1955	126	48	.38	9	1,860	20.0
1956	230	37	.16	26	5,161	20.0
1957	238	40	.17	40	7,936	20.0
1958	270	39	.15	38	7,670	20.0
1959	456	55	.12	51	10,238	19.9
1960	705	96	.14	92	16,800	18.3
1961	781	104	.13	98	18,691	19.1
1962	1,032	160	.15	150	29,482	19.6
1963	918	148	.16	126	25,004	19.9
			2. United States			
1953	43	12	.28	10	1,969	20.0
1954	162	31	.19	17	3,423	20.0
1955	126	48	.38	9	1,860	20.0
1956	229	36	.16	26	5,161	20.0
1957	238	40	.17	40	7,936	20.0
1958	270	39	.15	38	7,670	20.0
1959	456	55	.12	51	10,238	19.9
1960	698	92	.13	91	16,643	18.4
1961	777	102	.13	98	18,691	19.1
1962	1,031	159	.15	150	29,482	19.6
1963	916	146	.16	126	25,004	19.9

(a) Beginning in 1964 included in s.c. 400-99, 401-99 and 405-99

Table 15

Imports: Sodium metal, s.c. 400-51(a)

Tariff Items 208t and 263d

Year	Total Imports lb. (000)	Total Imports $ (000)	Unit Value $/lb.	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			1. Total			
1964	9,446	1,590	.17	41	6,127	15.0
			2. United Kingdom			
1964	10	2	.24	-	-	-
			3. United States			
1964	9,436	1,588	.17	41	6,127	15.0

(a) Prior to 1964 included in s.c. 8415

Table 16

Imports: Chemical elements n.e.s., s.c. 400-99(a)

Tariff Items 208, 208p, 208t, 711 and 851

Year	Total Imports lb. (000)	Total Imports $ (000)	Unit Value $/lb.	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			1. Total			
1964	5,421	1,129	.21	967	189,168	19.6
			2. United Kingdom			
1964	3	3	1.03	-	-	-
			3. United States			
1964	4,323	953	.22	794	154,616	19.5
			4. Italy			
1964	1,090	171	.16	171	34,241	20.0

(a) Prior to 1964 included in s.c. 8301, 8378 and 8415

Table 17

Imports: Acid, muriatic, s.c. 8003[(a)]

Tariff Items 217, 217a and 851

Year	Total Imports lb. (000)	Total Imports $ (000)	Unit Value $/lb.	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			1. Total			
1953	1,132	16	.01	16	2,490	15.7
1954	2,633	43	.02	43	5,903	13.9
1955	1,003	14	.01	14	2,237	16.1
1956	1,575	23	.01	23	3,544	15.3
1957	4,638	58	.01	58	10,449	17.9
1958	3,146	39	.01	39	7,079	18.0
1959	1,659	23	.01	23	3,750	16.6
1960	1,710	25	.01	25	3,849	15.3
1961	1,894	29	.02	29	4,327	15.0
1962	2,242	37	.02	36	5,650	15.6
1963	1,874	31	.02	30	4,424	14.5
			2. United States			
1953	1,132	16	.01	16	2,490	15.7
1954	2,633	43	.02	43	5,903	13.9
1955	1,003	14	.01	14	2,237	16.1
1956	1,575	23	.01	23	3,544	15.3
1957	4,638	58	.01	58	10,449	17.9
1958	3,146	39	.01	39	7,079	18.0
1959	1,659	23	.01	23	3,750	16.6
1960	1,710	25	.01	25	3,849	15.3
1961	1,894	29	.02	29	4,327	15.0
1962	2,242	37	.02	36	5,650	15.6
1963	1,874	31	.02	30	4,424	14.5

(a) Beginning in 1964 included in s.c. 401-99

Table 18

Imports: Sulphuric acid, s.c. 8008[(a)]

Tariff Items 217, 217a and 851

Year	Total Imports lb. (000)	Total Imports $ (000)	Unit Value $/lb.	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			1. Total			
1953	140	4	.03	3	310	9.0
1954	220	4	.02	4	495	12.9
1955	302	7	.02	7	679	10.1
1956	4,110	55	.01	43	5,639	13.0
1957	2,093	35	.02	23	1,881	8.2
1958	78,689	827	.01	805	171,005	21.3
1959	36,978	321	.01	300	73,610	24.5
1960	19,053	145	.01	101	21,785	21.6
1961	14,549	128	.01	84	14,940	17.7
1962	14,324	144	.01	94	14,377	15.3
1963	11,268	119	.01	77	9,460	12.3
1964	8,417	99	.01	44	5,305	11.9
			2. United States			
1953	140	4	.03	3	310	9.0
1954	220	4	.02	4	495	12.9
1955	302	7	.02	7	679	10.1
1956	4,110	55	.01	43	5,639	13.0
1957	2,093	35	.02	23	1,881	8.2
1958	78,688	827	.01	804	171,003	21.3
1959	36,978	321	.01	300	73,610	24.5
1960	19,053	145	.01	101	21,785	21.6
1961	14,549	128	.01	84	14,940	17.7
1962	14,323	144	.01	94	14,377	15.3
1963	11,268	119	.01	77	9,460	12.3
1964	8,417	98	.01	44	5,305	11.9

(a) Beginning in 1964 renumbered as s.c. 401-15

Table 19

Imports: Acid, nitric, s.c. 8005[a]

Tariff Items 216c, 711 and 851

Year	Total Imports lb. (000)	Total Imports $ (000)	Unit Value $/lb.	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			1. Total			
1953	298	19	.06	19	3,787	20.0
1954	863	43	.05	43	8,500	20.0
1955	488	27	.06	27	5,367	20.0
1956	204	16	.08	15	2,978	20.0
1957	320	18	.06	17	3,321	20.0
1958	4,811	185	.04	45	9,090	20.0
1959	214	18	.09	18	3,659	20.0
1960	253	21	.08	20	4,061	20.0
1961	197	21	.11	21	4,146	20.0
1962	183	25	.14	25	5,319	21.4
1963	179	15	.10	14	2,831	19.6
			2. United States			
1953	298	19	.06	19	3,787	20.0
1954	863	43	.05	43	8,500	20.0
1955	488	27	.06	27	5,367	20.0
1956	204	16	.08	15	2,978	20.0
1957	320	18	.06	17	3,321	20.0
1958	4,811	185	.04	45	9,090	20.0
1959	214	18	.09	18	3,659	20.0
1960	253	21	.08	20	4,061	20.0
1961	197	21	.11	21	4,146	20.0
1962	183	25	.14	25	5,319	21.4
1963	179	15	.10	14	2,831	19.6

(a) Beginning in 1964 included in s.c. 401-99

Table 20

Imports: Phosphoric acid, s.c. 8006[a]

Tariff Item 216b

Year	Total Imports lb. (000)	Total Imports $ (000)	Unit Value $/lb.	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			1. Total			
1953	844	58	.07	52	12,946	25.0
1954	701	57	.08	51	12,769	25.0
1955	444	45	.10	41	10,177	25.0
1956	487	42	.09	42	10,433	25.0
1957	294	18	.06	18	4,440	25.0
1958	424	25	.06	21	5,327	25.0
1959	88	8	.09	6	1,526	25.0
1960	77	8	.10	8	1,911	25.0
1961	2,357	112	.05	17	4,217	24.9
1962	748	41	.06	9	2,169	24.7
1963	46,085	1,253	.03	14	3,555	24.8
			2. United States			
1953	844	58	.07	52	12,946	25.0
1954	701	57	.08	51	12,769	25.0
1955	444	45	.10	41	10,177	25.0
1956	487	42	.09	42	10,433	25.0
1957	294	18	.06	18	4,440	25.0
1958	424	25	.06	21	5,327	25.0
1959	88	8	.09	6	1,526	25.0
1960	77	8	.10	8	1,911	25.0
1961	2,357	112	.05	17	4,217	24.9
1962	748	41	.06	9	2,169	24.7
1963	46,085	1,253	.03	14	3,555	24.8

(a) Beginning in 1964 included in 401-99

Table 21

Imports: Acid, arsenic, s.c. 8023[a]

Tariff Items 216, 711 and 791

Year	Total Imports lb. (000)	Total Imports $ (000)	Unit Value $/lb.
	1. Total		
1953	1,127	40	.04
1954	1,099	39	.04
1955	847	32	.04
1956	409	14	.04
1957	520	18	.04
1958	508	16	.03
1959	596	20	.03
1960	408	13	.03
1961	407	16	.04
1962	628	26	.04
1963	664	24	.04
	2. United States		
1953	1,127	40	.04
1954	1,099	39	.04
1955	847	32	.04
1956	409	14	.04
1957	520	18	.04
1958	508	16	.03
1959	596	20	.03
1960	375	12	.03
1961	407	16	.04
1962	605	25	.04
1963	609	22	.04

(a) Beginning in 1964 included in s.c. 401-99

Table 22

Imports: Arsenous oxide and arsenic sulphide, s.c. 8273[a]

Tariff Items 208 and 851

Year	Total Imports lb.	Total Imports $	Unit Value $/lb.
	1. Total		
1953	32,233	5,881	.18
1954	-	-	-
1955	-	-	-
1956	16,320	1,691	.10
1957	1,559	420	.27
1958	-	-	-
	2. United Kingdom		
1953	30,160	5,735	.19
1954	-	-	-
1955	-	-	-
1956	-	-	-
1957	-	-	-
1958	-	-	-
	3. United States		
1953	2,073	146	.07
1954	-	-	-
1955	-	-	-
1956	16,320	1,691	.10
1957	1,559	420	.27
1958	-	-	-

(a) Beginning in 1959 included in s.c. 8415

Table 23

Imports: Acid, boracic, in packages of not less than 25 pounds, s.c. 8001[a]

Tariff Items 208 and 851

Year	Total Imports lb. (000)	Total Imports $ (000)	Unit Value $/lb.	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			1. Total			
1953	3,803	198	.05	-	-	-
1954	2,349	128	.05	-	-	-
1955	3,020	185	.06	-	-	-
1956	3,724	250	.07	-	-	-
1957	3,181	210	.07	-	-	-
1958	3,264	198	.06	-	-	-
1959	4,518	248	.05	*	38	14.9
1960	4,663	262	.06	*	36	12.6
1961	4,520	280	.06	-	-	-
1962	5,326	351	.07	*	18	19.8
1963	3,029	197	.07	*	80	20.1
1964	3,276	224	.07	5	700	15.1
			2. United States			
1953	3,803	198	.05	-	-	-
1954	2,349	128	.05	-	-	-
1955	3,020	185	.06	-	-	-
1956	3,724	250	.07	-	-	-
1957	3,181	210	.07	-	-	-
1958	3,264	198	.06	-	-	-
1959	4,518	248	.05	*	38	14.9
1960	4,663	262	.06	*	36	12.6
1961	4,520	280	.06	-	-	-
1962	5,326	351	.07	*	18	19.8
1963	3,029	197	.07	*	80	20.1
1964	3,276	224	.07	5	700	15.1

(a) Beginning in 1964 renumbered as s.c. 401-31

Table 24

Imports: Acid, hydrofluosilicic, s.c. 8002 [a]

Tariff Items 208 and 851

Year	Total Imports lb. (000)	Total Imports $ (000)	Unit Value $/lb.	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			1. Total			
1953	126	14	.11	-	-	-
1954	104	12	.12	-	-	-
1955	157	17	.11	-	-	-
1956	193	18	.09	-	-	-
1957	181	14	.08	-	-	-
1958	201	15	.08	-	-	-
1959	224	16	.07	-	-	-
1960	185	13	.07	-	-	-
1961	232	27	.11	*	53	15.0
1962	170	13	.08	-	-	-
1963	958	40	.04	1	180	19.9
			2. United States			
1953	126	14	.11	-	-	-
1954	104	12	.12	-	-	-
1955	157	17	.11	-	-	-
1956	193	18	.09	-	-	-
1957	181	14	.08	-	-	-
1958	201	15	.08	-	-	-
1959	224	16	.07	-	-	-
1960	185	13	.07	-	-	-
1961	232	27	.11	*	53	15.0
1962	170	13	.08	-	-	-
1963	958	40	.04	1	180	19.9

(a) Beginning in 1964 included in s.c. 401-99

Table 25

Imports: Silica gel, s.c. 401-62[(a)]

Tariff Items 208t, 220al and 711

Year	Total Imports lb. (000)	Total Imports $ (000)	Unit Value $/lb.	Dutiable Value $ (000)	Duty Collected $ (000)	Duty as p.c. of Dutiable Value
			1. Total			
1964	6,197	1,322	.21	792	125,946	15.9
			2. United Kingdom			
1964	41	11	.27	*	24	14.2
			3. United States			
1964	6,156	1,311	.21	792	125,922	15.9

(a) Prior to 1964 included in s.c. 8415

Table 26

Imports: Inorganic acids and oxygen compounds of non-metals or metalloids n.e.s., s.c. 401-99[(a)]

Tariff Items various

Year	Total Imports lb. (000)	Total Imports $ (000)	Unit Value $/lb.	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			1. Total			
1964	78,054	2,486	.03	739	124,275	16.8
			2. United Kingdom			
1964	124	15	.12	7	1,083	15.7
			3. United States			
1964	77,065	2,398	.03	665	113,196	17.0

(a) Prior to 1964 included in various statistical classes

Table 27

Imports: Carbon bisulphide, n.o.p., s.c. 8395[a]

Tariff Items 208 and 851

Year	Total Imports lb. (000)	$ (000)	Unit Value $/lb.
	1. Total		
1953	588	30	.05
1954	524	27	.05
1955	527	27	.05
1956	1,236	59	.05
1957	41	3	.08
1958	27	2	.07
1959	631	34	.05
1960	2,846	147	.05
1961	643	34	.05
1962	106	7	.07
1963	85	5	.05
1964	-	-	-
	2. United States		
1953	588	30	.05
1954	524	27	.05
1955	527	27	.05
1956	1,236	59	.05
1957	41	3	.08
1958	27	2	.07
1959	631	34	.05
1960	2,846	147	.05
1961	643	34	.05
1962	106	7	.07
1963	85	5	.05
1964	-	-	-

(a) Beginning in 1964 renumbered as s.c. 405-08 and includes part of former s.c. 8071

Table 28

Imports: Ammonia anhydrous, s.c. 8265[(a)]

Tariff Items 208t and 711

Year	Total Imports		Unit Value	Dutiable Value	Duty Collected	Duty as p.c. of Dutiable Value
	ton	$ (000)	$/ton	$ (000)	$	
1. Total						
1953	8,403	699	83.14	158	31,679	20.0
1954	27,019	2,280	84.40	2,265	453,004	20.0
1955	23,292	1,987	85.31	1,967	393,131	20.0
1956	17,771	1,410	79.34	1,394	279,030	20.0
1957	27,065	1,990	73.53	1,990	398,001	20.0
1958	17,145	1,379	80.45	1,371	273,427	19.9
1959	5,593	423	75.63	423	92,485	21.9
1960	3,400	260	76.55	260	55,816	21.4
1961	6,750	516	76.48	469	100,860	21.5
1962	1,227	107	87.27	107	22,438	21.0
1963	3,252	253	77.77	71	8,147	11.5
1964	30,404	2,143	70.50	493	64,431	13.1
2. United States						
1953	8,403	699	83.14	158	31,679	20.0
1954	27,019	2,280	84.40	2,265	453,004	20.0
1955	23,292	1,987	85.31	1,967	393,131	20.0
1956	17,771	1,410	79.34	1,394	279,030	20.0
1957	27,065	1,990	73.53	1,990	398,001	20.0
1958	17,145	1,379	80.45	1,371	273,427	19.9
1959	5,593	423	75.63	423	92,485	21.9
1960	3,400	260	76.55	260	55,816	21.4
1961	6,750	516	76.48	469	100,860	21.5
1962	1,227	107	87.27	107	22,438	21.0
1963	3,252	253	77.77	71	8,147	11.5
1964	30,404	2,143	70.50	493	64,431	13.1

(a) Beginning in 1964 renumbered as s.c. 402-02 and includes part of former class 8264

Table 29

Imports: Potash, caustic, s.c. 8327 [(a)]

Tariff Items 209a1 and 209a2

Year	Total Imports lb. (000)	Total Imports $ (000)	Unit Value $/lb.	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			1. Total			
1953	4,346	246	.06	*	51	12.5
1954	5,445	288	.05	1	162	12.5
1955	4,941	275	.06	2	208	12.5
1956	5,884	332	.06	1	132	12.5
1957	7,302	350	.05	4	561	12.5
1958	8,838	460	.05	5	618	12.2
1959	8,486	428	.05	1	166	12.1
1960	8,819	450	.05	1	82	12.4
1961	3,414	255	.07	2	441	18.1
1962	3,319	222	.07	1	205	14.3
1963	4,336	298	.07	1	110	14.6
1964	3,649	337	.09	2	310	12.5
			2. United States			
1953	3,675	188	.05	*	51	12.5
1954	4,379	200	.05	1	80	12.5
1955	4,206	208	.05	2	208	12.5
1956	4,694	219	.05	1	132	12.5
1957	6,589	283	.04	3	322	12.5
1958	7,913	374	.05	5	564	12.5
1959	7,347	323	.04	1	139	12.6
1960	7,373	325	.04	1	76	12.6
1961	1,919	134	.07	2	441	18.1
1962	2,395	145	.06	1	205	14.3
1963	3,908	258	.07	1	110	14.6
1964	3,324	303	.09	2	310	12.5

Table 29
(Cont'd)

Year	Total Imports lb. (000)	Total Imports $ (000)	Unit Value $/lb.	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			3. France			
1953	170	16	.10	-	-	-
1954	379	36	.09	1	82	12.4
1955	104	12	.12	-	-	-
1956	583	55	.09	-	-	-
1957	388	36	.09	-	-	-
1958	272	25	.09	-	-	-
1959	557	51	.09	-	-	-
1960	611	48	.08	-	-	-
1961	594	42	.07	-	-	-
1962	510	40	.08	-	-	-
1963	155	15	.10	-	-	-
1964	-	-	-	-	-	-
			4. Germany, Fed. Rep. of			
1953	461	37	.08	-	-	-
1954	582	41	.07	-	-	-
1955	589	49	.08	-	-	-
1956	500	45	.09	-	-	-
1957	249	22	.09	2	239	12.5
1958	516	46	.09	-	-	-
1959	490	42	.09	-	-	-
1960	819	73	.09	-	-	-
1961	552	53	.10	-	-	-
1962	273	24	.09	-	-	-
1963	227	19	.09	-	-	-
1964	259	23	.09	-	-	-

(a) Beginning in 1964 renumbered as s.c. 402-09

Table 30

Imports: Soda, peroxide of, s.c. 8358[a]

Tariff Items 210 and 851

Year	Total Imports lb. (000)	Total Imports $ (000)	Unit Value $/lb.	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			1. Total			
1953	695	123	.18	122	15,299	12.5
1954	831	130	.16	74	9,240	12.5
1955	724	106	.15	53	6,682	12.5
1956	1,063	156	.15	75	9,375	12.5
1957	871	131	.15	52	6,461	12.5
1958	613	93	.15	26	3,203	12.5
1959	856	138	.16	60	7,515	12.5
1960	514	80	.16	26	3,216	12.5
1961	531	83	.16	17	2,210	12.8
1962	492	74	.15	17	2,206	13.1
1963	485	76	.16	16	2,041	12.5
			2. United Kingdom			
1953	-	-	-	-	-	-
1954	420	56	.13	-	-	-
1955	403	52	.13	-	-	-
1956	615	81	.13	-	-	-
1957	595	79	.13	-	-	-
1958	484	68	.14	-	-	-
1959	557	78	.14	-	-	-
1960	390	54	.14	-	-	-
1961	456	65	.14	-	-	-
1962	388	57	.15	-	-	-
1963	365	53	.14	-	-	-

Table 30
(Cont'd)

Year	Total Imports lb. (000)	Total Imports $ (000)	Unit Value $/lb.	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			3. United States			
1953	657	117	.18	117	14,658	12.5
1954	345	64	.18	64	7,953	12.5
1955	297	50	.17	50	6,193	12.5
1956	432	73	.17	73	9,080	12.5
1957	276	52	.19	52	6,461	12.5
1958	130	26	.20	26	3,203	12.5
1959	300	60	.20	60	7,515	12.5
1960	124	26	.21	26	3,216	12.5
1961	75	17	.23	17	2,210	12.8
1962	33	8	.25	7	1,042	13.9
1963	93	19	.21	12	1,548	12.5

(a) Beginning in 1964 included in s.c. 402-99

Table 31

Imports: Hydrogen peroxide solutions, s.c. 8373 [(a)]

Tariff Items 219(i) and 219(ii)

Year	Total Imports lb. (000)	Total Imports $ (000)	Unit Value $/lb.	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			1. Total			
1953	361	99	.27	99	22,329	22.5
1954	523	132	.25	132	29,622	22.5
1955	1,405	315	.22	245	55,152	22.5
1956	2,141	448	.21	445	100,017	22.5
1957	2,813	598	.21	597	134,296	22.5
1958	494	129	.26	127	28,639	22.5
1959	794	232	.29	231	52,013	22.5
1960	402	89	.22	85	19,188	22.5
1961	346	56	.16	55	12,199	22.3
1962	293	50	.17	50	10,448	20.8
1963	389	59	.15	57	12,228	21.4
1964	280	44	.16	44	9,823	22.3
			2. United States			
1953	339	96	.28	96	21,616	22.5
1954	491	128	.26	127	28,647	22.5
1955	1,263	296	.23	226	50,934	22.5
1956	2,110	442	.21	442	99,412	22.5
1957	2,791	597	.21	597	134,296	22.5
1958	484	127	.26	127	28,639	22.5
1959	780	230	.30	229	51,612	22.5
1960	186	62	.34	62	13,982	22.5
1961	35	18	.51	18	3,871	22.0
1962	31	12	.41	12	2,721	22.4
1963	42	14	.32	12	2,666	21.7
1964	39	15	.39	15	3,397	22.4

Table 31
(Cont'd)

Year	Total Imports lb. (000)	Total Imports $ (000)	Unit Value $/lb.	Dutiable Value $ (000)	Duty Collected $	Duty as p.c. of Dutiable Value
			3. Austria			
1953-58	-	-	-	-	-	-
1959	13	2	.13	2	401	22.5
1960	131	15	.12	15	3,391	22.5
1961	257	30	.12	30	6,831	22.5
1962	241	36	.15	36	7,234	20.2
1963	347	45	.13	45	9,562	21.3
1964	241	29	.12	29	6,426	22.3
			4. Germany, Fed. Rep. of			
1953	22	3	.14	3	713	22.5
1954	32	4	.14	4	975	22.5
1955	140	19	.13	19	4,218	22.5
1956	19	3	.14	3	605	22.5
1957-59	-	-	-	-	-	-
1960	67	8	.12	8	1,815	22.5
1961	3	2	.60	2	450	22.5
1962-64	-	-	-	-	-	-

(a) Beginning in 1964 renumbered as s.c. 405-45

Table 1

Exports: Salt, s.c. 7640[(a)]

Year	Quantity cwt.	Value $	Unit Value $/cwt.
1953	47,072	32,499	.69
1954	23,973	25,935	1.08
1955	2,929,432	1,000,501	.34
1956	6,678,701	2,286,830	.34
1957	9,157,752	3,241,119	.35
1958	8,134,140	2,917,269	.36
1959	25,481,540	4,639,522	.18
1960	..	3,461,366	..
1961	..	2,829,138	..
1962	..	3,987,668	..
1963	..	3,701,356	..
1964	..	3,618,569	..
1965	..	4,996,509	..

(a) Beginning in 1961 renumbered as s.c. 279-70, "Crude salt (sodium chloride) and brine". Beginning in 1962 renumbered as s.c. 279-72, "Salt (sodium chloride) and brine" and also includes part of class 146-99

Table 2

Exports: Sulphur, n.o.p., s.c. 7630[(a)]

Year	Quantity cwt.	Value $	Unit Value $/cwt.
1953	92,656	106,748	1.15
1954	66,772	90,158	1.35
1955	61,024	94,141	1.54
1956	86,627	128,116	1.48
1957	247,286	293,042	1.19
1958	152,150	170,966	1.12
1959	530,518	504,961	.95
1960	2,860,807	2,762,372	.97
1961	4,357,322	3,967,884	.91
1962	8,000,522	6,649,943	.83
1963	16,418,573	11,972,346	.73
1964	25,891,740	19,525,661	.75
1965	29,958,940	26,491,092	.88

(a) Beginning in 1961 renumbered as s.c. 279-77, "Sulphur, crude and refined n.e.s."

Table 3

Exports: Chlorine, liquid, or chlorine gas, s.c. 8355[a]

Year	Quantity cwt.	Value $	Unit Value $/cwt.
1953	358,180	810,799	2.26
1954	58,775	173,859	2.96
1955	208,937	492,585	2.36
1956	429,536	1,234,485	2.87
1957	209,876	623,934	2.97
1958	289,815	610,909	2.11
1959	336,889	570,939	1.69
1960	489,666	1,015,678	2.07
1961	399,308	884,787	2.22
1962	498,014	1,232,706	2.48
1963	539,914	1,427,464	2.64
1964	366,393	862,802	2.35
1965	782,480	1,577,177	2.02

(a) Beginning in 1961 renumbered as s.c. 400-03, "Chlorine"

Table 4

Exports: Selenium and salts, s.c. 6650[a]

Year	Quantity lb.	Value $	Unit Value $/lb.
1953	253,620	1,066,824	4.21
1954	344,292	1,943,752	5.65
1955	334,215	2,555,689	7.65
1956	409,729	6,342,748	15.48
1957	228,051	2,739,020	12.01
1958	250,351	1,700,906	6.79
1959	325,712	1,846,484	5.67
1960	404,410	2,796,407	6.91
1961	345,800	2,251,502	6.51
1962	325,600	2,033,978	6.25
1963	445,700	2,421,738	5.43
1964	401,300	2,206,084	5.50
1965	451,200	2,454,709	5.44

(a) Beginning in 1961 "Selenium" is classified in s.c. 400-37 and the salts are assigned to various other statistical classes

Table 5

Exports: Arsenic, s.c. 8330[a]

Year	Quantity cwt.	Value $	Unit Value $/cwt.
1953	9,353	39,675	4.24
1954	14,226	58,871	4.14
1955	9,406	40,794	4.34
1956	11,681	50,482	4.32
1957	32,298	119,616	3.70
1958	17,032	67,731	3.98
1959	11,304	46,460	4.11
1960	10,542	37,908	3.60
1961	2,445	10,263	4.20
1962	1	178	178.00
1963	48	284	5.92

(a) Beginning in 1961 renumbered as s.c. 401-27, "Arsenic trioxide (white arsenic)"; beginning in 1964 included in s.c. 401-99

Table 6

Exports: Calcium, s.c. 6642[a]

Year	Quantity cwt.	Value $	Unit Value $/cwt.
1955	..	1,283,279	..
1956	..	649,098	..
1957	..	77,492	..
1958	..	79,028	..
1959	..	73,555	..
1960	..	87,157	..
1961	1,107	116,841	105.55
1962	1,241	157,222	126.69
1963	921	109,069	118.42
1964	2,108	137,681	65.31
1965	1,483	117,124	78.98

(a) Beginning in 1961 renumbered as s.c. 400-61, "Calcium metal"

Table 7

Exports: Chemical elements n.e.s., s.c. 400-99[a]

Year	Quantity cwt.	Value $	Unit Value $/cwt.
1961	270,679	4,216,642	15.58
1962	233,001	3,431,397	14.73
1963	139,992	2,710,654	19.36
1964	275,550	4,797,938	17.41
1965	350,192	4,377,137	12.50

(a) Not available prior to 1961

Table 8

Exports: Acid, sulphuric, s.c. 8020[a]

Year	Quantity cwt.	Value $	Unit Value $/cwt.
1953	957,784	895,340	.93
1954	438,594	417,295	.95
1955	591,558	554,109	.94
1956	473,201	446,360	.94
1957	590,979	547,679	.93
1958	465,041	422,381	.91
1959	557,264	481,654	.86
1960	868,590	699,890	.81
1961	778,282	637,175	.82
1962	699,195	624,775	.89
1963	746,321	650,972	.87
1964	1,348,187	1,078,440	.80
1965	1,142,262	883,513	.77

(a) Beginning in 1961 renumbered as s.c. 401-15, "Sulphuric acid, including oleum"

Table 9

Exports: Inorganic acids and oxygen compounds of non-metals or metalloids n.e.s., s.c. 401-99[a]

Year	Quantity cwt.	Value $	Unit Value $/cwt.
1961	160,987	282,142	1.75
1962	338,556	954,725	2.82
1963	547,897	2,073,412	3.78
1964	532,858	1,938,449	3.64
1965	909,587	2,592,246	2.85

(a) Not available prior to 1961; beginning in 1964 includes s.c. 401-27

Table 10

Exports: Caustic soda, s.c. 8385[a]

Year	Quantity cwt.	Value $	Unit Value $/cwt.
1953	51,285	138,500	2.70
1954	3,770	10,201	2.71
1955	1,630	4,417	2.71
1956	141	828	5.87
1957	5,697	18,846	3.31
1958	34,196	20,189	.59
1959	55,985	32,857	.59
1960	63,693	95,269	1.50

(a) Beginning in 1961 included in s.c. 402-99

APPENDIX II

Principal Relevant Recommended Items

	Goods Subject to Duty and Free Goods	B.P.	M.F.N.	G.T.
R-7	208 - Argols Arsenic sulphides, natural Boric acid, crude natural Copper, crude precipitate of Sodium borates, crude natural, and concentrates thereof, calcined or not	Free	Free	Free
R-8	208g - Barium-cadmium complex, barium-silicon complex, calcium-magnesium complex, calcium-silicon complex; calcium molybdate, tungsten oxide, vanadium oxides, whether in powder, in lumps, or formed into briquettes by the use of a binding material; all the foregoing when for use in the manufacture of steel under such regulations as the Minister may prescribe	Free	Free	5
R-9	208k - Crude oxide of cobalt	Free	10	10
R-10	208t - Drugs, n.o.p., of a kind not produced in Canada	Free	15	25
R-12	210b - Sodium carbonates, natural	10	15	25
R-13	210d - Natural sodium sulphate	10	15	25
R-14	*211 - Bauxite, whether or not washed or calcined	Free	Free	Free
R-17	240 - Whiting or whitening; natural calcium sulphate, n.o.p.	Free	10	10
R-19	*295a - Wollastonite; natural zirconium silicate	Free	Free	Free
R-20	296b - (1) Magnesite, dead-burned or sintered, n.o.p.; magnesite, caustic calcined, n.o.p.; plastic magnesia, n.o.p.	15	15	30
	(2) Magnesium carbonate, basic or otherwise, excepting crude rock, n.o.p.	Free	15	25
R-21	296e - Magnesium oxide, or calcined magnesite, for use exclusively in the manufacture of electrical cables	Free	Free	Free

	Goods Subject to Duty and Free Goods	B.P.	M.F.N.	G.T.
R-24	*333 - Cinnabar	Free	Free	Free
R-25	*334 - Kryolite or cryolite, n.o.p.	Free	Free	Free
R-31	663b - Goods which enter into the cost of manufacture of fertilizers when imported for use exclusively in the manufacture of fertilizers	Free	Free	Free
R-32	*669 - Corundum, n.o.p., emery and garnet, in bulk, crushed or ground	Free	Free	Free
R-33	*671 - Artificial abrasive grains, other than chemically defined products, crushed or ground	Free	Free	Free
R-34	681d - Uranium depleted in U 235, in the form of pigs, ingots, billets, or bars; residues resulting from the processing abroad of uranium metal, salts or oxides	Free	Free	25
R-35	791 - Materials of all kinds for use in producing or manufacturing the products of Recommended Item 38.11, when imported exclusively for such use, whether or not otherwise enumerated in Schedule A, subject to such regulations as the Minister may prescribe	Free	Free	Free
R-36	Metals, n.o.p., not including alloys, in lumps, powders, ingots or blocks:			
	(1) Other than the following	Free	15	25
	(2) Cadmium	10	15	25
	(3) Cobalt	Free	10	25
	(4) Electrolytic manganese for alloying purposes	Free	Free	20
R-37	Natural oxides, n.o.p., not including ores of metals:			
	(1) Other than the following	Free	10	25
	(2) Antimony oxides	Free	$12\frac{1}{2}$	25
	(3) Copper oxides	Free	15	25
	(4) Manganese oxides	Free	Free	Free
	(5) Molybdenum oxides	10	15	25
	(6) Nickelous oxides	10	15	25
	(7) Tin oxides	Free	15	25
	(8) Zirconium oxide	Free	5	15
R-38	Calcined witherite (barium oxide)	Free	15	25

	Goods Subject to Duty and Free Goods	B.P.	M.F.N.	G.T.
25.01	Common salt (including rock salt, sea salt and table salt); pure sodium chloride; salt liquors; sea water:			
	(1) Other than the following per 100 pounds	Free	3¢	5¢
	(2) Salt for the use of the sea or gulf fisheries	Free	Free	Free
	(3) Table salt made by an admixture of other ingredients, when containing not less than ninety per cent of pure salt	5	10	15
	(4) Salt liquors and sea water per 100 pounds of contained salt	Free	3¢	5¢
25.03	Sulphur of all kinds, other than sublimed sulphur, precipitated sulphur and colloidal sulphur	Free	Free	Free
25.09	Earth colours, whether or not calcined or mixed together; natural micaceous iron oxides	Free	7½	20
28.01	Halogens (fluorine, chlorine, bromine and iodine):			
	(1) Other than the following	Free	Free	Free
	(2) Chlorine	10	15	25
	(3) Fluorine	Free	15	25
	(4) Iodine, other than crude	10	15	25
28.02	Sulphur, sublimed or precipitated; colloidal sulphur	Free	Free	Free
28.03	Carbon, n.o.p., including carbon black, anthracene black, acetylene black and lamp black	Free	Free	Free

	Goods Subject to Duty and Free Goods	B.P.	M.F.N.	G.T.
28.04	Hydrogen, rare gases and other non-metals:			
	(1) Other than the following	10	15	25
	(2) Arsenic	Free	15	25
	(3) Boron	Free	15	25
	(4) Helium	5	10	15
	(5) Krypton	Free	15	25
	(6) Neon	Free	15	25
	(7) Phosphorus	Free	15	25
	(8) Selenium	5	10	15
	(9) Tellurium	5	10	15
	(10) Xenon	Free	15	25
28.05	Alkali, alkaline-earth and rare earth metals; yttrium and scandium; mercury:			
	(1) Other than the following	Free	15	25
	(2) Mercury	Free	Free	Free
	(3) Sodium	Free	Free	Free
28.06	Hydrochloric acid, including anhydrous hydrogen chloride, and chlorosulphonic acid:			
	(1) Hydrochloric acid, including anhydrous hydrogen chloride	Free	15	25
	(2) Chlorosulphonic acid	Free	Free	Free
28.07	Sulphur dioxide	Free	Free	Free
28.08	Sulphuric acid; oleum	10	15	25
28.09	Nitric acid; sulphonitric acids	10	15	25
28.10	Phosphorus pentoxide and phosphoric acids (meta-, ortho- and pyro-)	Free	15	25
28.11	Arsenic trioxide, arsenic pentoxide and acids of arsenic:			
	(1) Other than the following	Free	15	25
	(2) Arsenic trioxide	10	15	25
28.12	Boric oxide and boric acid:			
	(1) Boric acid	Free	Free	Free
	(2) Boric oxide	Free	15	25

	Goods Subject to Duty and Free Goods	B.P.	M.F.N.	G.T.
28.13	Other inorganic acids and oxygen compounds of non-metals (excluding water):			
	(1) Other than the following	Free	15	25
	(2) Carbon dioxide	10	15	25
	(3) Fluoroboric acid	10	15	25
	(4) Fluorosilicic acid	Free	Free	Free
	(5) Hydrofluoric acid	10	15	25
	(6) Nitrous oxide	10	15	25
	(7) Sulphamic acid	Free	Free	Free
	(8) Sulphur trioxide	Free	Free	Free
28.14	Halides, oxyhalides and other halogen compounds of non-metals:			
	(1) Other than the following	Free	15	25
	(2) Phosphorus oxychloride	Free	Free	Free
	(3) Phosphorus pentachloride	Free	Free	Free
	(4) Phosphorus trichloride	Free	Free	Free
28.15	Sulphides of non-metals; phosphorus trisulphide:			
	(1) Other than the following	Free	Free	Free
	(2) Phosphorus pentasulphide	Free	5	20
	(3) Other sulphides of phosphorus including phosphorus trisulphide	Free	15	25
	(4) Silicon sulphide	Free	15	25
28.16	Ammonia, anhydrous or in aqueous solution	10	15	25
28.17	Sodium hydroxide (caustic soda); potassium hydroxide (caustic potash); peroxides of sodium or potassium:			
	(1) Potassium hydroxide (caustic potash)	$7\frac{1}{2}$	$7\frac{1}{2}$	20
	(2) Potassium peroxide	Free	15	25
	(3) Sodium hydroxide (caustic soda)	10	15	25
	(4) Sodium peroxide	Free	15	25
28.54	Hydrogen peroxide (including solid hydrogen peroxide or urea peroxide)	Free	15	25